ENGINEERING ANALYSIS

FACILITY HISTORY

Sklar Exploration Company, LLC (Sklar) operates Oil & Gas Production Area No. 6 (Area 6) under SMOP Nos. 502-0103-X001 and 502-0103-X002 in northern Escambia County, south of Castleberry, AL in Sections 13 & 24, Township 3 North, Range 10 East. Area 6 is currently comprised of 3 oil & gas wells: CCL&T 13-11 #1 well, CCL&T 13-15 #1 well (formerly CCL&T 13-16 #1), and CCL&T 24-1 #1; one 203 HP Caterpillar G3306B engine (for gas lift), two 163 HP Waukesha F1197 engines (for power oil lift), one 145 HP Caterpillar G3306B/NA engine (for power generation), and two 68 HP Arrow VRG330 engines (also for power generation) are permitted for use within Area 6.

PROJECT DESCRIPTION

On 5/3/17, the Department received a new application from Sklar requesting to add two additional well sites—each with tanks, flare, heater, and two engines—to Area 6. The wells would be the CCL&T 18-13 and tentatively the CCL&T 14-9. The mineral rights for both lie within quarter-sections adjacent to those of the established wells in Area 6.

Each well would operate with one 163 HP Waukesha F1197 power oil pump engine for artificial lift and and one 68 HP Arrow VRG330 generator engine. Sklar estimates 150 bbl/day of oil and 300 Mscf/day of gas production from each. The average heat value of the gas at the three established wells is 1462.1 Btu/scf (at 14.65 psia and 60 °F) based on recent test reports submitted in the application.

The engines throughout Area 6 are numerous, and for organizational purposes will be referred to as follows in this analysis and in future permits:

\A/ - II	Life Consider	NI NI	О	Marri Marra
Well	Lift Engine	New Name	Generator Engine	New Name
CCL&T 24-1 #1	163 HP Waukesha	LIFT-1	68 HP Arrow	GEN-1
CCL&T 13-11 #1	203 HP Caterpillar	LIFT-2	68 HP Arrow	GEN-2
CCL&T 13-15 #1	163 HP Waukesha	LIFT-3	145 HP Caterpillar	GEN-3
CCL&T 18-13 #1	163 HP Waukesha	LIFT-4	68 HP Arrow	GEN-4
CCL&T 14-9 #1	163 HP Waukesha	LIFT-5	68 HP Arrow	GEN-5

Table 1 - Engine listing

PROCESS DESCRIPTION

At each well site, the crude oil and produced water streams exiting out of the heater treater flows on to the power oil tank and salt water tank. Natural gas from the separators is routed to the pipeline when possible and the well-site flare when not. Flash vapor from the power oil tank and breathing and working losses from all the storage tanks is collected and sent to the flare for combustion. The flare at the well uses produced gas as pilot gas. The wells in Area 6 all reflect this general setup.

At the 13-11 well, LIFT-2 drives a compressor which provides artificial lift (which improves yield) by injecting gas into the well to increase the flow of the produced wellstream; GEN-2 drives a generator to provide power for the site. At the 24-1 well, LIFT-1 drives a power oil pump used to recirculate crude from the power oil tank back into the well to provide artificial lift, while its GEN-1 drives a generator to provide power for the site. At the 13-15 well (site of the dry 13-16 well), LIFT-3 will also drive a power oil pump when constructed, while GEN-3 will drive a generator for the site (Sklar requested a larger generator at the 13-15 site in case they expand operations in the area in the future, possibly placing the processing equipment for a new well on the same surface location of the 13-15 well). The 18-13 and 14-9 wells will have engine setups mirroring the 24-1 well with the engines designated LIFT-4, GEN-4, LIFT-5, and GEN-5.

PROCESS EMISSIONS

The potential emission sources for the facility currently include separators, tanks, and engines at the three established well sites. The increase in potential emissions from this project would come from similar equipment at the two additional well sites.

Heater emissions are determined using EPA's AP-42 factors. Emissions from the separators and tanks at each site are controlled by flares; potential to emit (PTE) for the flares is determined by AP-42 factors and mass balance based upon continuously burning gas at rates reported in the 2015 engineering analysis for SMOP No. 502-0103-X001 for the three established wells and 300 MMscf/day for the two proposed wells. The gas qualities for both the three established wells and the two proposed wells are from the gas analyses in Sklar's new application for this project. The Department calculates flare PTE from oil & gas wellsites as if all produced gas gets flared while oil production continues, though in ideal & typical practice Sklar sells both its gas and its oil.

Potential to emit (PTE) for the currently permitted LIFT-2 and GEN-3 were calculated as if the engines would operate at the limits imposed on them by 40 CFR Part 60 Subpart JJJJ. Those limits are: 1.0 g(NO_X)/HP-hr, 2.0 g(CO)/HP-hr, and 0.7 g(VOC)/HP-hr. These engine are controlled by EMIT Technologies non-selective catalytic reduction devices (catalytic converters) capable of meeting those limits. LIFT-1 is subject to Subpart JJJJ's reconstructed engine limits of 3.0 g(NO_X)/HP-hr, 4.0 g(CO)/HP-hr, and 1.0 g(VOC)/HP-hr, and its PTE is calculated as if it met those limits (though its catalytic converter is rated for better). GEN-1, GEN-2, & LIFT-3 are uncontrolled, and their calculated PTE reflects that.

Sklar has not ordered the individual engines that will be put into use at the 18-13 and 14-9 wells, but they have asserted in their application that they will be two 163 Waukesha F1197 HP power oil pump engines (LIFT-4 & LIFT-5) and two 68 HP Arrow VRG330 generator engines (GEN-4 & GEN-5), each constructed prior to 2006 and not subject to Subpart JJJJ. They have indicated their intent to operate all engines with EMIT Technologies NSCR devices regardless of not being subject to Subpart JJJJ.

For all engines with a catalytic converter, the estimated uncontrolled VOC emissions are lower than the maximum VOC emissions guaranteed by EMIT Technologies. This is because the engines are burning natural gas instead of LPG fuel, while EMIT Technologies' catalytic converters are designed to abide by the Subpart JJJJ standards of NO_X, CO, and VOC emissions at less than 1.0, 2.0, and 0.7 g/HP-hr respectively (standards which are shared by both natural gas and lean-burn LPG engines). Due to the nature of NSCR control devices, the VOC from the exhaust of natural gas engines will be controlled by those catalytic converters, but EMIT Technologies have just not quantified how much they will control below the 0.7 g/HP-hr level. This analysis will thus use the lower, "uncontrolled" VOC emission factors reported by Caterpillar and Waukesha, though the true PTE for VOC from these engines will be lower. The VOC factor from Waukesha is further inflated because it is reported as non-methane hydrocarbons (ethane + VOC).

Table 2 below shows the potential emissions of the facility after only accounting for required controls on the separators & tanks (flares) and engines subject to Subpart JJJJ limits (catalytic converters), drawing from data from past applications and analyses for the existing emission sources.

	Pollutant	Heaters	Flares	Engines	Total Emissions
	PM	0.11	0.78	0.42	1.31
Criteria Pollutant Emissions (TPY)	SO ₂	0.01	0.30	0.05	0.36
eria Pollut Emissions (TPY)	NO _X	1.66	29.82	106.66	138.14
eria I imis (TE	СО	1.17	162.24	128.54	291.95
Crite	voc	0.08	172.25	6.98	179.31
	Total HAPs	0.03	18.17	1.97	20.17
St	CO ₂	1,766.54	56,158.83	5,213.78	63,139.15
Emissions _TPY)	N ₂ O	0.01	0.10	0.01	0.12
Emiss (TPY)	CH ₄	0.06	160.85	3.67	164.58
ЭНВ	Mass Sum	1,766.61	56,319.78	5,217.46	63,303.85
g	CO _{2e}	1,770.67	60,208.97	5,308.58	67,288.21

Table 2 – Facility Potential Emissions after required control devices

Area 6 is subject to facility-wide SMOP limits of 95 TPY for CO. When writing the initial permit (X001), to allow for growth the Department did not require Sklar to adhere to a flare-specific CO limit derived by taking 95 TPY CO and subtracting the Engine and Heater PTE values calculated at the time. The actual flare emissions from the 12 months prior to January 1, 2017 were given in the semi-annual report as 6.002 Tons CO, which illustrates the capability of the facility to meet its current SMOP limits of 95 TPY for CO facility-wide without the need for a flare-specific limit even if the number of flares in operation were increased with the operation of 13-15 well and the addition of 18-13 and 14-9 wells. In practice, Sklar only flares when there are pipeline or other process problems disrupting the transfer of gas to the nearby gas plant, or if the well's production is too low to produce gas with adequate pressure to be transported through the pipeline.

Sklar has indicated their intention use NSCR converters on LIFT-3 when installed and on each engine at the 18-13 and 14-9 wells when permitted, though Subpart JJJJ standards that would necessitate that do not apply to that engine. Without using catalytic converters for those engines not subject to JJJJ, the total engine potential emissions are ~128.54 TPY CO and ~106.66 TPY NO_X, plus ~1.17 TPY CO and ~1.66 TPY CO from the heaters, exceeding the 100 TPY SMOP threshold for each without considering the emissions from Sklar's flares (which are more flexible).

EMISSIONS LIMITS

SMOP Nos. 502-0103-X001 & -X002 have a facility-wide 95 TPY limit on CO because when the SMOP was issued, CO was the only criteria pollutant with a calculated PTE of greater than the 100 TPY for major sources. At the time, the second-closest criteria pollutant to the 100 TPY threshold was VOC with ~78 TPY; VOC now exceeds the 100 TPY threshold after considering the new units in this proposal. Therefore, Sklar has requested a 95 TPY SMOP limit for VOC with the addition of these two wells. The flares at Area 6 have the potential to emit greater than 10 TPY of n-hexane (a HAP) based on the information provided in their application, which would exceed the 10 TPY major source threshold for any single species of HAP; they would not exceed the major-source threshold of 25 TPY multi-species HAPs. However, based on data provided to me, if facility's VOC emissions were limited to 95 TPY and if 7 TPY of that VOC were from the engines, Area 6 would always remain under 10 TPY of n-hexane emissions. Therefore the facility-wide SMOP limit for VOC effectively also functions as a SMOP limit for n-hexane.

There are unit-specific limits on LIFT-2, LIFT-1, and GEN-3 proscribed by NSPS Subpart JJJJ (reconstructed limits for GEN-3). Table 3 below shows the Subpart JJJJ standard in question for engines of this power.

	,	JJJJ Emission Standards										
	g	g/HP-hr ppmvd at 15% O ₂										
	NO _x	СО	voc	NO _x	СО	voc						
New	1.0	2.0	0.7	82	270	60						
Reconstructed	3.0	4.0	1.0	250	540	86						

Table 3 – Subpart JJJJ Engine Emission Standards

Neither the LIFT-3 nor any of the proposed engines at the new wells will be subject to NSPS Subpart JJJJ based on their construction dates. Because the facility cannot operate under 100 TPY CO and NO_X if these engines were to be uncontrolled and because the Department cannot account for the control devices Sklar has volunteered to use without a limit and/or permit provision when evaluating PTE, Sklar has proposed that they will operate LIFT-3, LIFT-4, LIFT-5, GEN-4, & GEN-5 with the EMIT Technologies catalytic converters specified in the application. Sklar will show continuous compliance by calculating its total emissions every month, and to do so Sklar will test its engines to determine emission factors to be used in those calculations.

REGULATIONS

STATE REGULATIONS

ADEM Administrative Code Rule 335-3-4-.01(1)(a and b), "Visible Emission"

ADEM 335-3-4-.01(a) states that no person shall emit to the atmosphere an opacity of greater than twenty percent (20%) over a six (6) minute period. **ADEM 335-3-4-.01(b)** states that during one six minute period in any sixty minute period a person may discharge into the atmosphere from any source of emissions, particulate of an opacity not greater than that designated as forty percent (40%) opacity. Therefore, the units would be subject to this regulation. Since natural gas, or propane as a back-up, would be burned in those units, opacity should be negligible; however, if visible emissions are observed, the opacity should be determined using Method 9 of 40 CFR Part 60 Appendix A.

ADEM Administrative Code Rule 335-3-5-.01(b), "Fuel Combustion"

This regulation covers fuel combustion sulfur limitations for Category II counties, which includes Escambia County. This regulation requires that fuel combustion source in Category II counties limit sulfur compounds to less than 4.0 lb/MMBtu. The fuel-burning units burn propane and raw natural gas (with no appreciable H_2S) and accordingly have negligible SO_2 emissions.

ADEM Administrative Code, Rule 335-3-14-.04, "Prevention of Significant Deterioration (PSD) Permitting"

Based on the emissions found in Tables 2, the facility could exceed 250 tons per year (TPY) major source threshold for criteria pollutants for this type of facility (oil & gas production facilities are not one of the 28 source categories listed in this regulation) for CO. However, the facility currently operates and will continue to operate under a 95 TPY limit on CO, which is far more stringent than an anti-PSD limit such as 249 TPY CO. Greenhouse Gas (GHG) Regulations require a facility to address PSD regulations for Greenhouse Gases. Greenhouse Gases of concern for these sources would be CO₂, N₂O, and CH₄. Per Rule 335-3-14-.04(2)(a)1.(i)&(ii), no PSD review would be necessary for this project.

ADEM Admin. Rule 335-3-14-.06, "Determinations for Major Sources in Accordance with Clean Air Act Section 112(g)"

This regulation applies to major sources of hazardous air pollutants (HAPs) constructed after March 27, 1998. Since the addition the new units would not make this facility a major source of HAPs, a 112(g) case by case MACT review would not be necessary.

ADEM Administrative Code, Rules 335-3-15, "Synthetic Minor Operating Permits (SMOPs)" and 335-3-16, "Major Source Operating Permits (MSOPs)"

The combined PTE of the wells exceed the 100 TPY major source threshold for CO, NO_X , & VOC., and the facility also is also presumed to have the potential to emit greater than 10 TPY or more of a single HAP (n-hexane) as shown in Table 2. However, because Sklar accepted a 95 TPY limit on CO, NO_X , & VOC and because that 95 TPY limit on VOC essentially functions as a <10 TPY limit on n-hexane, the facility operates as a synthetic minor for both criteria pollutants and HAPs. Additionally, Sklar has adopted unit-specific SMOP limits on several engines to meet their facility-wide SMOP limits for NO_X and CO; namely, Sklar will operate catalytic converters on LIFT-3, LIFT-4, LIFT-5, GEN-4, & GEN-5 and will test each combination of engine model and control device models among those every 5 years for NO_X and CO emission factors.

FEDERAL REGULATIONS

40 CFR Part 60 Subpart A, "General Provisions"

This subpart is applicable given that facility is subject to one of the applicable subparts found under 40 CFR Part 60.

40 CFR Part 60 Subpart JJJJ, "Standards of Performance for Stationary Spark Ignition Internal Combustion Engines"

This subpart is applicable to stationary spark ignition internal combustion engines as specified in §60.4230(a)(1)-(6). LIFT-2 and GEN-3 were manufactured in after 2011, meaning the provisions of §60.4233(e) and the applicable standards of Table 1 of that Subpart are applicable to those engines. LIFT-1, which the Department approved operation of on 5/12/17, was manufactured in 1974 and was reported to be reconstructed after June 12, 2006. It is subject to the standards for reconstructed stationary natural gas engines above 100 HP [§60.4233(f)(4)].

GEN-1, GEN-2, LIFT-3, LIFT-4, GEN-4, LIFT-5, & GEN-5 were all manufactured in prior to 2006 according to their applications, meaning only the provisions of §60.4236 are applicable to those engines [§60.4230(a)(6)]. However, because that engines have not been reported to be modified or reconstructed since June 12, 2006, those listed engines are not subject to this subpart.

	,	JJJJ E	missio	n Stan	dards						
	g	g/HP-hr ppmvd at 15% O ₂									
	NO _x	СО	voc	NO _x	СО	voc					
New	1.0	2.0	0.7	82	270	60					
Reconstructed	3.0	4.0	1.0	250	540	86					

Table 3– Subpart JJJJ Engine Emission Standards

40 CFR Part 60 Subpart OOOOa, "Standards of Performance for Crude Oil and Natural Gas Facilities For Which Construction, Modification or Reconstruction Commenced After September 18, 2015"

This regulation was promulgated by EPA contains SO₂ and VOC requirements for natural gas production wells and natural gas processing plants constructed, reconstructed, or modified after September 18, 2015. The following table summarizes the portions of this regulation that apply specifically to well sites as affected facilities under this regulation:

AFFECTED SOURCES	APPLICABILITY
Each well [§60.5365(a)]	This applies to a single gas or oil well that is hydraulically
	fractured or re-fractured
Pneumatic Controller [§60.5365(d)(1) and (2)]	This applies to a single continuous-bleed natural-gas-driven
	pneumatic controllers with a bleed rate of > 6 scf/hr at an oil
	or natural gas production segment
Storage Vessels [§60.5365(e)]	This applies to a single storage vessels located in the oil and
	natural gas production segment, natural gas processing
	segment or natural gas transmission and storage segment
	that has potential VOC emissions > 6 TPY
Hydraulically Fractured Gas Wells [§60.5365(i)]	This applies to the collection of fugitive emissions components
	at a well site

Single Well

The 18-13 and 14-9 wells would not be affected sources under this subpart since they will be neither hydraulically fractured nor refractured, being in the Smackover layer.

Pneumatic Controller

Sklar has not indicated that they intend to construct any continuous-bleed gas-driven controllers at the 18-13 and 14-9 wells; therefore, the Department does not expect pneumatic controller affected sources as defined by this subpart to be present.

Storage Vessels

The storage vessels at the 18-13 and 14-9 wells will be constructed after September 18, 2015; the power oil tanks would be considered a Group 2 storage vessel under this subpart based on its uncontrolled emissions. At the wells, tank vapor is routed to a flare for combustion. §60.5365a(e) however only applies to tanks with an uncontrolled PTE of greater than 6 TPY of VOCs, and the determination of PTE "may take into account requirements under a legally and practically enforceable limit in an operating permit or other requirement established under a Federal, State, local or tribal authority". Because the permit includes a stipulation that Sklar may not emit gas without combustion, the closed-vent systems and flares should be included in the PTE determination of potentially subject tanks. Post-control device, the VOC emissions from all tanks are <6 TPY, and the tanks do not meet the definition of *storage vessels* under Subpart OOOOa.

Fugitive Emissions Components at a Well Site

Fugitive emissions components at the 18-13 and 14-9 wells applicable to this regulation will include the pumps, pressure relief devices, valves, connectors, and other required devices/systems (except compressors) in capable of leaking methane or VOC. As outlined in §60.5397a(a), the aforementioned equipment are subject to the leak standards in §60.5397a(b)-(g), the reporting requirements of §60.5397a(j) and the recordkeeping requirements of §60.5397a(i).

40 CFR Part 63 Subpart A, "General Provisions"

This subpart is applicable only provided that the facility is subject to one of the applicable subparts found under 40 CFR Part 63.

40 CFR 63 Subpart ZZZZ, "National Emission Standards for Hazardous Air Pollutant for Stationary Reciprocating Internal Combustion Engines (RICE)"

This regulation is also referred to as the RICE MACT and is applicable to any stationary reciprocating internal combustion engine that would be located at a major source of HAPs emissions or an area source of HAPs emissions. A stationary RICE at an area source of HAP emissions is existing if construction of that unit is commenced before June 12, 2006 (§63.6590(a)(1)(iii)). GEN-3 and LIFT-2 are therefore classified as a new RICE. Altogether, they are classified as a new, non-black-start 4SRB stationary RICE located at an area source; their status as *remote* has not been determined. <u>ADEM has not adopted the area source provisions of Subpart ZZZZ</u>, but to comply with federal regulations Sklar must meet the requirements under Subpart ZZZZ. §63.6590(c)(1) states that the requirements of Subpart ZZZZ are met by complying with Part 60 Subpart JJJJ. LIFT-1 is a reconstructed source rather than a new source. However, §63.6590(c)(1) applies to both reconstructed and new sources, so it would meet the requirements of Subpart ZZZZ by complying with the applicable requirements of Subpart JJJJ.

GEN-1, GEN-2, LIFT-3, LIFT-4, GEN-4, LIFT-5, & GEN-5 were first placed into service prior to the effective date for this regulation, and because the definition for *construction* in §63.2 specifically excludes the removal and reassembling of a unit as construction, so they would be classified as existing RICEs. Altogether, they would be classified as existing, non-black start, <500 HP, 4SRB stationary RICEs located at an area source. The engines' status as remote or non-remote was not determined. <u>ADEM has not adopted the area source provisions of Subpart ZZZZ</u>, but to comply with federal regulations Sklar must meet the requirements under Subpart ZZZZ. Sklar should meet the following EPA requirements for the above engines:

Emission Standards

Compliance with this subpart is met by meeting the following work/management practices specified in Table 2d (Nos. 10) of subpart ZZZZ upon startup (§63.6595(a)):

- For the engine, work/management practices involving:
 - O Change oil and filter every 1,440 hours of operation or annually, whichever comes first (you have the option of utilizing an oil analysis program in order to extend the specified oil change requirements as specified in 40 CFR §63.6625(j)).
 - Inspect spark plugs every 1,440 hours of operation or annually, whichever comes first, and replace as necessary.
 - Inspect all hoses and belts every 1,440 hours of operation or annually, whichever comes first, and replace as necessary.

At all times, the engine shall be in compliance with the applicable emission limitations, operating limitations, and other requirements (§63.6605(a)). At all times an affected source must be operated and maintained, including associated air pollution control equipment and monitoring equipment, in a manner consistent with safety and good air pollution control practices for minimizing emissions (§63.6605(b)).

The engine's time spent at idle and the engine's startup time at startup shall be minimized to a period needed for appropriate and safe loading of the engines, not to exceed 30 minutes after which time the non-startup emission limitations apply (§63.6625(h)).

Compliance and Performance Test Methods and Procedures

No performance testing is required by Subpart ZZZZ for this engine since there are no Subpart ZZZZ numerical emission standards to comply with.

Emission Monitoring

Continuous compliance with the requirements of this subpart is met by complying with the requirements specified in Table 6 (No. 9) as follows:

- For all the RICE at facility, to show compliance with work/management practices:
 - Operate and maintain the stationary RICE according to the manufacturer's emission-related operation and maintenance instructions.
 OR
 - Develop and follow your own maintenance plan which provides, to the extent practicable, maintenance and operation of the engine in a manner consistent with good air pollution control practices for minimizing emissions (§63.6625(e)(8)).

Recordkeeping and Reporting Requirements

As per §63.6655, records used to show continuous compliance with items in Table 6 must be maintained. No reports are required for the engines because they have less than 500 HP.

RECOMMENDATIONS

This analysis indicates that Area 6 would meet continue to meet the requirements of all federal and state rules and regulations with the addition two new well sites and associated equipment. Based on increased potential emissions, Sklar has proposed 95 TPY NO_X and VOC limits for the facility to remain a synthetic minor source. The 95 TPY VOC limit would function to also keep Area 6 a synthetic minor or area source for HAPs (hexane) based on information provided in their application. Sklar has also proposed to operate several engines not subject to Subpart JJJJ with control devices in order to remain a synthetic minor source for NO_X and CO. Additionally, the naming convention of the permitted engines will be altered for the permit.

I recommend that the current SMOPs No. 502-0103-X001 & -X002 be rescinded and replaced with a new X003 permit, which will also include the two new wells proposed in the application.

____ June 29, 2017
Date

R. Jackson Rogers, Jr. Industrial Minerals Section Energy Branch Air Division ADEM

ATTACHMENT A
TABLES



Well	Lift Engine	New Name	Generator Engine	New Name
CCL&T 24-1 #1	163 HP Waukesha	LIFT-1	68 HP Arrow	GEN-1
CCL&T 13-11 #1	203 HP Caterpillar	LIFT-2	68 HP Arrow	GEN-2
CCL&T 13-15 #1	163 HP Waukesha	LIFT-3	145 HP Caterpillar	GEN-3
CCL&T 18-13 #1	163 HP Waukesha	LIFT-4	68 HP Arrow	GEN-4
CCL&T 14-9 #1	163 HP Waukesha	LIFT-5	68 HP Arrow	GEN-5

Table 1 – Engine listing

	Pollutant	Heaters	Flares	Engines	Total Emissions
	PM	0.11	0.78	0.42	1.31
Criteria Pollutant Emissions (TPY)	SO ₂	0.01	0.30	0.05	0.36
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Crite	VOC	0.08	172.25	6.98	179.31
	Total HAPs	0.03	18.17	1.97	20.17
S	CO ₂	1,766.54	56,158.83	5,213.78	63,139.15
Emissions TPY)	N ₂ O	0.01	0.10	0.01	0.12
Emiss (TPY)	CH₄	0.06	160.85	3.67	164.58
GHG)	Mass Sum	1,766.61	56,319.78	5,217.46	63,303.85
g	CO _{2e}	1,770.67	60,208.97	5,308.58	67,288.21

Table 2 – Facility Potential Emissions after required control devices

	JJJJ Emission Standards										
	g	/HP-h	r	ppmvd at 15% O ₂							
	NO _x CO VOC NO _x CO VOC										
New	1.0	2.0	0.7	82	270	60					
Reconstructed											

Table 3 – Subpart JJJJ Engine Emission Standards

ATTACHMENT B EMISSION CALCULATIONS



LIFT-1

		L	DATA:												
			2	4-1 Gas L	ift (LIFT-1))				AP-42	Emission	n Factors			
ENGINE TYP	Έ	=	4SF	RB	N	G					(lb/MMBtu	1)			
FUEL HEAT	CONTENT	=	1,416	Btu/Scf			Туре	PM	SO ₂ ¹	NO _X	СО	voc	CH ₂ O	Other I	HAPs
FUEL H2S C	ONTENT	=	10.00	ppmv			Diesel	3.10E-1	[By Mass]	4.41E+0	9.50E-1	3.50E-1	1.18E-3	2.69	E-3
MAXIMUM EN	NGINE HP	=	163	HP			2SLB			3.17E+0		1.20E-1	5.52E-2	2.53	E-2
ENGINE OP	HOURS	=	8,760	Hr			4SLB	7.71E-5	5.88E-4	4.08E+0	3.17E-1	1.18E-1	5.28E-2	2.10	E-2
ENGINE RAT	ΓING	=	1.30	MMBtu/hr			4SRB	9.50E-3	5.88E-4	2.27E+0	3.72E+0	2.96E-2	2.05E-2	1.20	E-2
BRAKE-SPE	CIFIC			Btu/				40	CFR Part	98 Subpa	rt C			GW	/P
FUEL CONS	UMPTION	=	8,000	HP-hr						Emission				N ₂ O=	298
CALCULATI	ON BASIS	=	Contr	olled and	d Unconti	rolled			Tables C	C-1 & C-2				CO ₂ =	1
EMISSION I	FACTORS				URER'S E				(kg/N	IMBtu)				CH ₄ =	25
(EF			Uncont	rolled	Contr	olled			N ₂ O	CO ₂	CH₄				
NC) _X	=	16.57	g/HP-hr	3	g/HP-hr		Diesel	0.0006	75.04	0.003				
CC		=		g/HP-hr		g/HP-hr		NG A	0.0001	53.06	0.001				
VO	С	=		g/HP-hr		g/HP-hr		LPG	0.0006	62.72	0.003				
CH		=		g/HP-hr		g/HP-hr		Propane	37	61.46	0.003				
CH		=		g/HP-hr		g/HP-hr		11000	0.000	01.10	0.000				
31	•4				ntrolled 16	•	l ne Emis	ssions Cal	culations						
			Should		1	- yı		our	- 2.2.10113	1		Uncon	rolled	Contro	المط
	0.0095	l h	1 20	MMBtu	8760 Hrs	1 Ton		C E					Tons		Tons
PM			1.30 H			2000 Lb		S.F.	- 4	-	= "	Ye		Yea	
	MME	วเน	П	<u> </u>	Year	2000 Lb						1e	ar	166	ar
	0.0006	lb	1.30	MMBtu	8760 Hrs	1 Ton		S.F.	10	ppmv S		0.01	Tons	0.01	Tons
SO ₂	MME		H		Year	2000 Lb		0	1020020020000	ppmv S	=	Ye		Year	
				•	1 4 4					ррии с					
NO _x	16.57	g	163.00	HP	1 Lb	8,760	Hr	1 Ton	1	S.F.		26.08	Tons	4.72	Tons
NOX	HP-	Hr			453.6 g	Yea	ar	2000 Lb	000 Lb		=		ar	Yea	ar
со	16.57	•	163.00	HP	1 Lb	8,760	ESPECIAL .	1 Ton		S.F.	=		Tons		Tons
	HP-	Hr			453.6 g	Yea	ar	2000 Lb				Ye	ar	Yea	ar
	0.12	a .	163.00	ШΡ	1 Lb	8.760	Hr	1 Ton		S.F.		0 10	Tons	0 10	Tons
voc	0. 12 HP-	_	103.00	TIE	453.6 g		1000	2000 Lb		З. Г.	=	Ye		Yea	
	111 -	1 11			430.0 g	166	<i>1</i> 1	2000 LD				10.	41	100	и 1
	0.2500	g	163.00	HP	1 Lb	8.760	Hr	1 Ton		S.F.		0.39	Tons	0.39	Tons
CH ₂ O	HP-	Hr			453.6 g	Yea	ar	2000 Lb			=	Ye	ar	Yea	ar
non-CH ₂ O	0.0120	lb	1.30	MMBtu		8,760	Hr	1 Ton		S.F.	_	0.07	Tons	0.07	Tons
HAPs	MME	3tu	Н	r		Yea	ar	2000 Lb			_	Ye	ar	Yea	ar
		1415								_			_		_
CO ₂		MMBtu	53.06	_	DEFECTIONS.	etric Ton			1.10231		=	668.12		668.12	
	Hi	4	MMI	3tu	l k	g	Y	ear/	1 M	Ton		Ye	ar	Yea	ar
	1 30	MMBtu	0.0001	ka	0 001 M	etric Ton	8,760	Hr	1.10231	Tons		0.00	Tons	0.00	Tons
N ₂ O	Hı		MMI			g		'ear		Ton	=	Ye		Yea	
			IVIIVII	Jiu .	^	9	,	Car	'''	1011					
011	1.02	g	163.000	HP	1 1	Lb	8,760	Hr	1	Ton		1.61	Tons	1.61	Tons
CH₄	HP-	Hr			453	.6 g	γ	'ear	2000	Lbs	=	Ye	ar	Yea	ar
	668.12	Tons	+	0.0013	Tons	+		1.6054	To	ns	=	669.72	Tons	669.72	Tons
Mass Sum	Yea	ar	т	Y	ear			Y	ear		_	Ye	ar	Yea	ar
	CC)2			N ₂ O			(CH₄						
	668.12				TPY*298	+		1.605 TPY*25 =		_	708.63		708.63		
CO ₂ e		12	+	Λ	0.38		40.14				Vo.	ar Year			

¹ EPA AP-42 factors assume gas to have 2000 gr S/MMScf (at EPA STP). This equates to 3.44 ppmv S, assuming ideal gas. AP-42 factor can be corrected to sulfur value of facility gas by comparing actual sulfur values to EPA reference point. Assume ppmv H₂S = ppmv S (true if H₂S = TRS and TRS is entirely monosulfur compounds).

GEN-1

			DATA:												
			24	-1 Genera	ator (GEN-	1)				AP-42	Emission	on Factors			
ENGINE TYP	PΕ	=	4SF	2R	· N	G				71 12	(lb/MMBtu				
FUEL HEAT		=	,	Btu/Scf		_	Туре	PM	SO ₂ 1	NO _x	СО	voc	CH ₂ O	Other	HAPs
FUEL H2S C		=	10.00						_	4.41E+0		3.50E-1	1.18E-3	2.69	
MAXIMUM EN		=		HP			2SLB			3.17E+0		1.20E-1	5.52E-2	2.53	
ENGINE OP		=	8,760				4SLB	7.71E-5	5.88E-4			1.18E-1	5.28E-2	2.10	E-2
ENGINE RAT		=		MMBtu/hr			4SRB				3.72E+0		2.05E-2	1.20	
BRAKE-SPE	CIFIC		,	Btu/						98 Subpa				GW	/P
FUEL CONS		=	8,000	HP-hr						Emission				N ₂ O=	298
CALCULATI	ON BASIS	=	Contr	olled and	d Unconti	olled			Tables C	C-1 & C-2				CO ₂ =	1
EMISSION I	FACTORS				URER'S E				(kg/N	MBtu)				CH₄=	25
(EF			Uncont	rolled	Contr	olled			N ₂ O	CO ₂	CH₄				
NC) _Y	=		g/HP-hr		g/HP-hr		Diesel	0.0006	75.04	0.003				
CC				g/HP-hr		g/HP-hr		NG A	0.0001	53.06	0.001				
VO		=		g/HP-hr		g/HP-hr		LPG	0.0006	62.72	0.003				
CH				g/HP-hr		g/HP-hr		Propane	10"	61.46	0.003				
CH	-	=	0.07	g/HP-hr		g/HP-hr		Торало	0.0000	01.10	0.000				
0.	14		ontrolled:		ntrolled 68	•	e Emis	sions Calc	ulations						
						· · · · · · · · · · · · · · · ·	-	l l		İ		Uncon	rolled	Contr	ollod
	0.0095	l h	0.54	MMBtu	8760 Hrs	1 Ton		S.F.				HET	Tons		Tons
PM	0.0095 MMI		0.54 H		Year	2000 Lb	- 1	Э.Г.	- 4		= "	Ye		Yea	
	IVIIVII	วเน	П		rear	2000 LD						16	21	160	aı
	0.0006	lb	0.54	MMBtu	8760 Hrs	1 Ton		S.F.	10	ppmv S		0.00	Tons	0.00	Tons
SO ₂	MMI	3tu	Н	r	Year	2000 Lb			3.44	ppmv S	=	Ye	ar	Yea	ar
NO _X	14.4	g	68.00	HP	1 Lb	8,760	Hr	1 Ton		S.F.	_	9.46	Tons	9.46	Tons
,	HP-	Hr			453.6 g	Yea	ar	2000 Lb				Ye	ar	Yea	ar
	40.0	_	00.00	ш	2.15	0.700	Lle	1 Ton		0.5		10.70	T	10.70	T
co	16.3 HP-	-	68.00	HP	1 Lb	8,760	ESSESSION.	400000000000000000000000000000000000000		S.F.	=	10.70 Ye:	Tons	10.70 Yea	
	HP-	Hr			453.6 g	Yea	ar .	2000 Lb				Te	41	100	aı
	3.00	g I	68.00	HP	1 Lb	8,760	Hr	1 Ton		S.F.		1.97	Tons	1.97	Tons
voc	HP-				453.6 g	Yea	1000	2000 Lb			=	Ye	ar	Yea	ar
CH₂O	0.0700	g	68.00	HP	1 Lb	8,760	Hr	1 Ton		S.F.		0.05	Tons	0.05	Tons
01120	HP-	Hr			453.6 g	Yea	ar	2000 Lb			_	Ye	ar	Yea	ar
								4 =		0.5		0.00	-	0.00	-
non-CH₂O HAPs	0.0120	Oloho.		MMBtu		8,760		1 Ton		S.F.	=		Tons		Tons
парѕ	MMI	3tu	Н	r		Yea	ar	2000 Lb				Ye	ar	Yea	ar
	0.54	MMBtu	53.06	ka	0 001 Me	etric Ton	8 760	Hr	1.10231	Tons		278.72	Tons	278.72	Tons
CO ₂	H	Volume 1	MMI			g	-	'ear		Ton	=	Ye		Yea	
N ₂ O	0.54	MMBtu	0.0001	kg	0.001 Me	etric Ton	8,760	Hr	1.10231	Tons	_	0.00	Tons	0.00	Tons
1120	H	r	MMI	3tu	k	g	γ	'ear	1 M	Ton	=	Ye	ar	Yea	ar
															_
CH₄	***	MMBtu	0.001		0.001 Me		8,760		1.10231		=		Tons		Tons
	H		MMI	≾tu	l k	g	}	ear	1 M	Ton		Yea	ar	Yea	ar
	278.72	Tone		0.0005	Tone			0.0053	To	ns		278.73	Tone	278.73	Tone
Mass Sum	276.72 Ye:		+		ear	+			ear	0110	=	278.73 Yea		278.73 Yea	
mass Suill	CC											160	A.	160	
		7 2		ı	N₂O				CH₄						
	278.72	TPY*1		0.0005	TPY*298			0.005	TP	/*25		279.01	Tons	279.01	Tons
CO ₂ e	278.		+		.16	+	0.005 TPY*25 0.13		=	Ye		Yea			
CO₂e					N ₂ O		0.13 CH₄								

¹ EPA AP-42 factors assume gas to have 2000 gr S/MMScf (at EPA STP). This equates to 3.44 ppmv S, assuming ideal gas. AP-42 factor can be corrected to sulfur value of facility gas by comparing actual sulfur values to EPA reference point. Assume ppmv H₂S = ppmv S (true if H₂S = TRS and TRS is entirely monosulfur compounds).

24-1 Flare

24-1 Flare	•													
Data	Total		Separ	ator Gas	Tan	k Gas	Pilo	ot Gas	GWP (11/	GWP (11/29/2013)		Part 98	Sub C GHG E	mission
Volume	12,701.740	scf/hr (Ind.)	300.0	Mscf/day	4.8	Mscf/day	0.0	Mscf/day	N ₂ 0=	298		Factor	's (Table C-1)	
H ₂ S mol%	0.0010%	mol%	0.0010%	mol%	0.0000%	mol%	0.0000%	mol%	CO ₂ =	1	N ₂ 0=		0.0001	kg/MMBt
Heat Content	1427.25	Btu/scf (Ind)		Btu/scf (Ind)		Btu/scf (Ind)		Btu/scf (Ind)	CH₄=	25	AF	42 Em	issions Facto	ors ⁷
VOC MW	10.75	lb/lb-mol ²	10.49	lb/lb-mol ²	26.76	lb/lb-mol ²	4 3.2 4	lb/lb-mol ²			NO _X =		0.068	lb/MMBtu
CO ₂	0.81%	mol%	0.82%	mol%	0.18%	mol%	0.00%	mol%			CO=		0.37	lb/MMBtu
CH₄	61.80%	mol%	62.31%		30.03%		0.00%				PM ₁ =		40	μg/L
C ₆	1.07	lb/lb-mol ²	1.06	lb/lb-mol ²	1.78	lb/lb-mol ²	0.00	lb/lb-mol ²						
OP Hours	8760	Hrs							(Ind. STP)	scf/lbmol=	380.67	60 °F	14.65	<mark>5</mark> psia
Destruction Eff	98.00%	DRE	Hea	at Input	18.13	MMBtu/hr ¹			(EPA STP)	scf/lbmol=	385.5	68 °F	14.696	psia
5		1		Po	tential F	lare Emissi	ion Calcu	lations	1					
Pollutants	40	μg	12701.7	scf (Ind.)	2.2E-9 lb	8,760	Шr	1 Ton	28.31685	1 1 01	f/EDA)		0.44	
PM ₁	L	μ9		Hr	2.2E-9 ID	Yea		2,000 Lb	scf (EPA		scf(EPA) scf(Ind.)	- =	Yea	Tons
					μ9		-		SCI (LI Z	, ,	301(1110.)			-
22	168.3	Lb SO ₂ ⁴	12.702	MScf (Ind.)	0.001%	H ₂ S Mol%	8,760	Hr	1 Ton			_	0.092	2 Tons
SO ₂	MScf (Inc	d.)		Hr				'ear	2,000 Lb			=	Yea	r
NO _x	0.068	lb		MMBtu	8,760		A DESCRIPTION OF THE PARTY OF T	Ton						Tons
	MMBtu	J		Hr	\ \	/ear	2,0	00 Lb				=	Yea	r
	0.37	lb	18 120	MMBtu	8,760 Hr		1	Ton					20 370	Tons
со	0.57 MMBtu			Hr		rear		00 Lb				= -	Yea	
	IVIIVIDIC			111		cai								
VOC⁵	12,701.7	Scf (Ind.)	1	lb-mol	10.75	Lb VOC	8,760	Hr	1 Ton	2.00%	Inv. DRE	_	31.422	2 Tons
VOC	Hr		380.67	scf (Ind.)	Lb	-Mole	Year		2,000 Lb] = [Yea	r
				4										
HAPs ⁸	12,701.7	Scf (Ind.)		lb-mol	COLOR COLOR	Lb C ₆	8,760 Hr		1 Ton	2.00%	Inv. DRE	- =		Tons
	Hr		380.67	scf (Ind.)	Lb	-Mole	Year		2,000 Lb				Yea	r
CO ₂ 5,6	98.00% DRE	1.11E+08	Scf (Ind.)	1.61	lb-mol C	O ₂ (stoich.)	1	lb-mol gas	44.01	lb CO₂	1 Ton		10,132.14	Tons
of Combustion	00.0070 2.1.2	Yr			1004000400400	as (stoich.)	CONTRACTOR OF THE PROPERTY OF		lb-mol		2,000 Lb		Yea	
								, ,		2	1			
CO ₂	1.11E+08	Scf (Ind.)	0.81%	mol% CO ₂	1	lb-mol	44.01	Lb CO2	1 Ton			_	52.09	Tons
of Fuel	Yr	4			380.67	scf (Ind.)	Lb-mole		2,000 Lb			_ [Yea	r
											_			
N₂O	0.001 M Ton	0.001427 Scf (Ir		12,701.7 Hr		0.0001 MME		8,760 Ye		1.1023	Tons ric Ton	- = -	0.0175 Yea	Tons
	Ng .	301 (11	10.)			IVIIVIL	, iu	16	aı	i ivicu	1011		Tea	
CH,	1.11E+08	Scf (Ind.)	2.00%	Inv. DRE	61.80%	mol% CH ₄	1	lb-mol	16.043	Lb CH4	1 Ton		28.98	Tons
Uncombusted	Yr						380.675	scf (Ind.)	Lb-m		2,000 Lb	=	Yea	r
											'			
	10,184.23	Tons		+	0.0175	Tons		+	28	.98 Tons			10,213.22	
Mass Sum	Year)	⁄ear		·		Year			Yea	r
		CO2				N2O				CH4				
	10,184.23	TPY	X 1		0.0175	TPY	X 298		28.98	TP :	X 25		40.040.04	
CO,e		184.23		+	0.01.0	5.22	7. 200	+	20.00	724.46	. 20	= -	10,913.91 Yea	
CO ₂ e		CO2				N2O		'		CH4			100	
1		4						-6		СП4				-
	apacity (MMBtu/													-
	nole) = Σ (Mole%								IG Spreed	Sheet for	gas anal	ysis		
³ Has to be ma	intained <500 lb,	/hr or 20 pp	bv offsite	e concentra	tion coul	d potential	ly be exc	eeded						
	H_2S (Lb/hr) = Vo	lume (Scf/h	r) * (1 lb-	mol/380.67	7) *(H ₂ S n	nol%) * (34.	.08 Lb H ₂ S	(Lb-mol)						
	on Factor 168.3													
30/ 00/14/013/		2,		f) *(1Lb-Mo	lo /360 e.	7 Scf* / <i>EA (</i>	166 I P CO	/Ib Mala\			1			
5	-	. ,	SCI/IVISC	i) (Trn-IAIO	16/380.6	/ JUI) (64.(700 FD 20	₂ , LD-IVIOIE)						
	flare is 98% eff													
	sing the gas analy		L d	 			<u> </u>	<u></u>				1 -		
	ere, Y _j = mole frac									n aloxide	e, etc.) ai	na K _j = n	iumper of ca	arbon
	ydrocarbon cons				bon diox	ide, 2 for e	thane, 3 f	or propane	e, etc.		I			
	d to be "lightly s											\square		-
" Hexane is a H	IAP. Assume Hex	canes+ or He	exane are	HAPS										

LIFT-2

LIF I-Z															
		L	DATA:												
			13	3-11 Gas	Lift (LIFT-2	•				AP-42	Emission				
ENGINE TYP		=	4SF		N	G				1	(lb/MMBtu	ı)			
FUEL HEAT		=	1,462	Btu/Scf			Type	PM	SO ₂ ¹	NO _X	со	voc	CH ₂ O	Other I	
FUEL H2S C	ONTENT	=		ppmv			Diesel	3.10E-1	[By Mass]	4.41E+0	9.50E-1	3.50E-1	1.18E-3	2.691	
MAXIMUM EN	IGINE HP	=	203				2SLB			3.17E+0		1.20E-1	5.52E-2	2.531	
ENGINE OP		=	8,760	Hr			4SLB			4.08E+0		1.18E-1	5.28E-2	2.10	
ENGINE RAT	ING	=	1.62	MMBtu/hi			4SRB	9.50E-3	5.88E-4	2.27E+0	3.72E+0	2.96E-2	2.05E-2	1.201	E-2
BRAKE-SPE		=	8,000	Btu/						98 Subpa				GW	P
FUEL CONS				HP-hr				Greenh		Emission	Factors			N ₂ O=	298
CALCULATI	ON BASIS	=			d Unconti					C-1 & C-2				CO ₂ =	1
EMISSION F					URER'S E	F			(kg/N	MBtu)				CH ₄ =	25
<u>(EF</u>			Uncont	rolled	Contr	olled			N₂O	CO ₂	<u>CH₄</u>				
NO	x	=	16.57	g/HP-hr	1	g/HP-hr		Diesel	0.0006	75.04	0.003				
CC)	=	16.57	g/HP-hr	2	g/HP-hr		NG	0.0001	53.06	0.001				
VO	0	=	0.12	g/HP-hr		g/HP-hr		LPG	0.0006	62.72	0.003				
CH ₂	0	=	0.25	g/HP-hr		g/HP-hr		Propane	0.0006	61.46	0.003				
СН	4	=	1.02	g/HP-hr		g/HP-hr									
		С	ontrolled a	nd Unco	ntrolled 20	3 HP Engi	ne Emis	sions Cal	culations						
												Uncont	rolled	Contro	olled
РМ	0.0095	Lb	1.62	MMBtu	8760 Hrs	1 Ton		S.F.				0.07	Tons	0.07	Tons
PIVI	MMI	3tu	Н	r	Year	2000 Lb			A		= `	Yea	ar	Yea	ar
SO ₂	0.0006	lb			8760 Hrs	loctoriorioriorio.		S.F.	Control Control	ppmv S			Tons		Tons
2	MMI	3tu	Н	r	Year	2000 Lb			3.44	ppmv S		Yea	ar	Yea	ar
	16 E7	a	202.00	LID	116	8.760	Шr	1 Ton		C.E		22.40	Tons	1 06	Tons
NO _X	16.57 HP-		203.00	ПР	1 Lb 453.6 g	8,760 Yea	4000	2000 Lb	-	S.F.	=	32.46 Yea		Yea	
	ПГ-	П			455.0 g	160	ai	2000 LD				160	21	166	21
	16.57	g	203.00	HP	1 Lb	8,760	Hr	1 Ton		S.F.		32.48	Tons	3.92	Tons
со	HP-	Hr			453.6 g	Yea	ar	2000 Lb	7		=	Yea	ar	Yea	ar
voc	0.12		203.00	HP	1 Lb	8,760	1	1 Ton		S.F.			Tons		Tons
	HP-	Hr			453.6 g	Yea	ar	2000 Lb				Yea	ar	Yea	ar
	0.2500	a	203.00	UD	1 Lb	8.760	Hr	1 Ton		S.F.		0.40	Tons	0.40	Tons
CH ₂ O	0.2300 HP-	CACOUNTY TO	203.00	ПЕ	453.6 g	Yea		2000 Lb		З.Г.	- =	Yea		Yea	
		П			455.0 g	160	al .	2000 LD				100	21	166	21
non-CH₂O	0.0120	lb	1.62	MMBtu		8,760	Hr	1 Ton		S.F.		0.09	Tons	0.09	Tons
HAPs	MMI	3tu	H	r	-	Yea	ar	2000 Lb			=	Yea	ar	Yea	ar
CO ₂	1.62	MMBtu	53.06		0.001 Me	etric Ton	8,760	Hr	1.10231			832.07		832.07	
002	H		MMI	3tu	k	g	γ	'ear	1 M	Ton		Yea	ar	Yea	ar
	4.00	NANAD+	0.0004	Lan /	I 0 001 14	atria Tan	0.700	11	4 40004	T		0.00	Tons	0.00	Tons
N ₂ O		MMBtu	0.0001		101010017	etric Ton	<i>8,760</i>		1.10231	Tons	=	Vea		Vea	
	Hı		ММ	วเน	, x	g	r	'ear	I IVI	1011		160	21	160	21
	1.02	g	203.000	HP	1 1	Lb	8,760	Hr	1	Ton		2.00	Tons	2.00	Tons
CH₄	HP-	_				.6 g	-	'ear		Lbs	=	Yea		Yea	
						_									
	832.07	Tons		0.0016	Tons			1.9994	To	ns	_	834.07	Tons	834.07	Tons
Mass Sum		ear	+		Y	'ear		_ _	Yea	ar	Yea	ar			
	CC)2			N ₂ O			(CH₄						
	832.07				TPY*298	+		1.999		/ *25	=	882.53		882.53	
CO₂e	832.		+	0	.47	L.		49	9.98			Yea	ar	Yea	ar
	CC)2			N ₂ O			(CH₄						

¹ EPA AP-42 factors assume gas to have 2000 gr S/MMScf (at EPA STP). This equates to 3.44 ppmv S, assuming ideal gas. AP-42 factor can be corrected to sulfur value of facility gas by comparing actual sulfur values to EPA reference point. Assume ppmv H₂S = ppmv S (true if H₂S = TRS and TRS is entirely monosulfur compounds).

GEN-2

GEN-2			DATA:				1								
				11 Gener	rator (GEN-	-2)				AD-42	Emission	Factors			
ENGINE TYP) <u></u>	=	4SF		•	G G				AF-42	(lb/MMBtu				
FUEL HEAT		=		Btu/Scf		u	Туре	PM	SO ₂ 1	NO _x	CO	voc	CH ₂ O	Other	НΛОс
FUEL H2S C		=	- 1	ppmv					_	4.41E+0		3.50E-1	1.18E-3	2.69	
MAXIMUM EN		=	68	• •			2SLB			3.17E+0		1.20E-1	5.52E-2	2.53	
ENGINE OP		=	8,760				4SLB	7.71E-5	5.88E-4			1.18E-1	5.28E-2	2.10	
ENGINE RAT		=		MMBtu/hr			4SRB				3.72E+0		2.05E-2	1.20	
BRAKE-SPE			0.54				4300					2.90L-2	2.00L Z	GW	
FUEL CONS		=	8,000	Btu/ HP-hr						98 Subpa Emission				N ₂ O=	298
CALCULATI		=	Cambu		<mark>d Unconti</mark>	ام ما ا				C-1 & C-2				CO ₂ =	1
EMISSION F		-			URER'S E					MBtu)				CH ₄ =	25
(EF			Uncont		Contr				N ₂ O	CO ₂	CH₄			0114=	23
NO NO		=		g/HP-hr	Oona	g/HP-hr		Diesel	0.0006	75.04	0.003				
CC								NG		53.06					
VO		=		g/HP-hr g/HP-hr		g/HP-hr		LPG	0.0001	ACCESS.	0.001				
		=		g/HP-nr g/HP-hr		g/HP-hr		400	0.0006	62.72	0.003				
CH ₂	-	=	0.07			g/HP-hr	_	Propane	0.0006	61.46	0.003				
CH	14	=	`antrallad	g/HP-hr	ntrolled 68	g/HP-hr	4	alana Cala	latiana						
			on a one a	and Onco	illi olled od	o ne ciigii	ie cilis	SIONS Care	uiations					0 1	- 111
					 <i>!!</i>							Uncon		Contro	
PM	0.0095				8760 Hrs		4	S.F.	- 4		=	Montoclookook.	Tons		Tons
	MMI	3tu	Н	r	Year	2000 Lb						Ye	ar	Yea	ar
	0.0006	lh	0.54	MMBtu	8760 Hrs	1 Ton		S.F.	1	ppmv S		0.00	Tons	0.00	Tons
SO ₂	MMI		0.54 H		Year	2000 Lb		J.1 .	popoopoopooo.	ppmv S	=	Ye		Yea	
	IVIIVII	olu	П	l	I Gai	2000 LD			3.44	ppiliv 3		100	21	100	a 1
	14.4	g	68.00	HP	1 Lb	8,760	Hr	1 Ton	1	S.F.		9.46	Tons	9.46	Tons
NO _X	HP-	_			453.6 g	Yea	ar	2000 Lb			=	Ye	ar	Yea	ar
co	16.3	g	68.00	HP	1 Lb	8,760	Hr	1 Ton		S.F.		10.70	Tons	10.70	Tons
	HP-	Hr			453.6 g	Yea	ar	2000 Lb			_	Ye	ar	Yea	ar
						0.700	11	- T		0.5		4.07	T	4.07	T
voc	3.00	_	68.00	HP	1 Lb	8,760	1000	1 Ton		S.F.	=	1.97 Ye:	Tons	1.97 Yea	Tons
	HP-	Hr	Do		453.6 g	Yea	ar	2000 Lb				Yes	ar	Yea	ar
	0.0700	a I	68.00	HP	1 Lb	8.760	Hr	1 Ton		S.F.		0.05	Tons	0.05	Tons
CH ₂ O	HP-		00.00	111	453.6 g	Yea	DESCRIPTION OF THE PROPERTY OF	2000 Lb		0.11.	=	Yes		Yea	
					1.00.0 9			2000 20							
non-CH₂O	0.0120	lb	0.54	MMBtu		8,760	Hr	1 Ton		S.F.		0.03	Tons	0.03	Tons
HAPs	MMI	3tu	Н	r		Yea	ar	2000 Lb			=	Yea	ar	Yea	ar
CO ₂		MMBtu	53.06	_	1011010010	etric Ton	-		1.10231		=	278.72		278.72	
_	Н		MMI	3tu	k	g	γ	ear/	1 M	Ton		Ye	ar	Yea	ar
	0.54	MMBtu	0.0001	ka	0 001 14	etric Ton	8.760	Шr	1.10231	Tone		0.00	Tons	0.00	Tons
N ₂ O	0.34 H		MMI			g		'ear		Ton	=	Ye		Yea	
			IVHVII	Jiu		9	,	cai	1 101	1011		10.	41	100	41
011	0.54	MMBtu	0.001	kg	0.001 Me	etric Ton	8,760	Hr	1.10231	Tons		0.01	Tons	0.01	Tons
CH₄	Н	r	MMI	_	k	g	γ	'ear		Ton	=	Ye	ar	Yea	
	278.72	Tons		0.0005	Tons	,		0.0053	To	ns	_	278.73	Tons	278.73	Tons
Mass Sum	Ye	ar	+	Y	ear	+		Y	ear		_	Ye	ar	Yea	ar
	CC) ₂			N ₂ O			(CH₄						
	278.72				TPY*298	+		0.005		/ *25	_	279.01		279.01	
CO ₂ e	278		+	0.	.16	·		0	0.13			Ye	ar	Yea	ar
	CC	O_2			N ₂ O			C	CH₄						

¹ EPA AP-42 factors assume gas to have 2000 gr S/MMScf (at EPA STP). This equates to 3.44 ppmv S, assuming ideal gas. AP-42 factor can be corrected to sulfur value of facility gas by comparing actual sulfur values to EPA reference point. Assume ppmv H₂S = ppmv S (true if H₂S = TRS and TRS is entirely monosulfur compounds).

LIFT-3

		D	ATA:												
			13	15 Power	r Oil (LIFT-	3)				AP-42	Emission	Factors			
ENGINE TYP	'E	=	4SF		, N	<i>'</i>				AI -12	(lb/MMBtu				
FUEL HEAT				Btu/Scf		_	Туре	PM	SO ₂ 1	NO _x	СО	voc	CH₂O	Other I	HAPs
FUEL H2S C	ONTENT		4.50	ppmv			Diesel	3.10E-1	[Bv Mass]	4.41E+0	9.50E-1	3.50E-1	1.18E-3	2.69	
MAXIMUM EN	IGINE HP	=	163	• •			2SLB	3.84E-2	. ,			1.20E-1	5.52E-2	2.53	E-2
ENGINE OP	HOURS	=	8,760	Hr			4SLB	7.71E-5	5.88E-4	4.08E+0		1.18E-1	5.28E-2	2.10	E-2
ENGINE RAT	ING	=	1.30	MMBtu/hr			4SRB		5.88E-4	2.27E+0	3.72E+0	2.96E-2	2.05E-2	1.20	E-2
BRAKE-SPE	CIFIC			Btu/						98 Subpa				GW	'P
FUEL CONS		=	8,000	HP-hr						Emission				N ₂ O=	298
CALCULATI	ON BASIS	=		Uncon	trolled				Tables C	C-1 & C-2				CO ₂ =	1
EMISSION F	ACTORS		M		URER'S E	F			(kg/N	IMBtu)				CH ₄ =	25
(EF			Uncont	rolled	Contr	olled			N ₂ O	CO ₂	CH ₄				
NO	x	=	13.5	g/HP-hr	0.5	g/HP-hr		Diesel	0.0006	75.04	0.003				
CC		=		g/HP-hr		g/HP-hr		NG A	0.0001	53.06	0.001				
VO	2			g/HP-hr		g/HP-hr		LPG	0.0006	62.72	0.003				
CH ₂		=		g/HP-hr		g/HP-hr		Propane	0.0006	61.46	0.003				
CH		=		g/HP-hr		g/HP-hr		Порашо	0.000	01.10	0.000				
311	4	-			163 HP En	•	sions C	alculation	IS						
		1	55	5	, <u></u> 11	J0			-			Uncont	rolled		
	0.0095	lh l	1 20	MMBtu	8760 Hrs	1 Ton		S.F.					Tons		
PM	0.0095 MMI		1.30 H		Year	2000 Lb		Э.Г.	-4		= "	Yea			
	IVIIVII	olu	П		rear	2000 LD						10	21		
	0.0006	lb	1.30	MMBtu	8760 Hrs	1 Ton		S.F.	4.5	ppmv S		0.00	Tons		
SO ₂	MMI	3tu	Н		Year	2000 Lb			NAME OF TAXABLE PARTY.	ppmv S	=	Yea	ar		
NO _x	13.5	-	163.00	HP	1 Lb	8,760	Hr	1 Ton		S.F.	=	21.25	Tons		
,	HP-	Hr			453.6 g	Yea	ar	2000 Lb				Yea	ar		
	47	_	100.00	LID	4.11	0.700	Lle	1 Ton		0.5		00.70	T		
co	17 HP-		163.00	HP	1 Lb	8,760	10010010	1 Ton		S.F.	=	26.76 Yea	Tons		
	HP-	Hr			453.6 g	Yea	वा	2000 Lb				10	ar		
	0.35	q I	163.00	HP	1 Lb	8,760	Hr	1 Ton		S.F.		0.55	Tons		
VOC	HP-	_			453.6 g	Yea	1000	2000 Lb			- =	Yea	ar		
CH₂O	0.0500	g	163.00	HP	1 Lb	8,760	Hr	1 Ton		S.F.	- =	0.08	Tons		
O112O	HP-	Ĥr			453.6 g	Yea	ar	2000 Lb			_	Yea	ar		
								1					_		
non-CH ₂ O	0.0120	in the same of the		MMBtu		8,760		1 Ton		S.F.	=		Tons		
HAPs	MMI	3tu	Н			Yea	ar	2000 Lb				Yea	ar		
	1.30	MMBtu	53.06	ka	0 001 Me	etric Ton	8 760	Hr	1.10231	Tons		668.12	Tons		
CO ₂	H	Victoria de la constanta de la	MMI		k			'ear		Ton	- =	Yea			
						9									
N ₂ O	1.30	MMBtu	0.0001	kg	0.001 Me	etric Ton	8,760	Hr	1.10231	Tons		0.00	Tons		
N ₂ O	H	f	MMI	3tu	k	g	γ	'ear	1 M	Ton	=	Yea	ar		
CH₄		MMBtu	0.001			etric Ton	8,760		1.10231		=		Tons		
	H		MMI	3tu	k,	g	Y	'ear	1 M	Ton		Yea	ar		
	660 10	Tons		0.0013	Tono			0.0100	т-	no		668.13	Tone		-
Maco Sum	668.12		+			+		0.0126		ns	- =	668.13 Yea			
Mass Sum	Yea				ear				ear			16	a1		
	CC	/2			N₂O			(CH₄						
	668.12	TPY*1		0.0013	TPY*298			0.013	TP\	/*25		668.81	Tons		
CO₂e	668.		+		38	+			.31		=	Yea			
JU20	550)2		J.	-			•	-						

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GEN-3

GEN-3			DATA:				ī								
		1		15 gener	ator (GEN-	-3)				AD 40	Fusicaion	Factors			
ENGINE TYP)E			ŭ	•	G				AP-42	(lb/MMBtu				
FUEL HEAT		=	4SF	Btu/Scf		G	Туре	PM	SO ₂ 1	NO _x	CO	voc	CH ₂ O	Other	UADo.
FUEL H2S C				ppmv			Diesel			4.41E+0		3.50E-1	1.18E-3	2.69	
MAXIMUM EN		=	145	• •			2SLB	3.84E-2	5.88E-4			1.20E-1	5.52E-2	2.53	
ENGINE OP		=	8,760				4SLB	7.71E-5	5.88E-4	4.08E+0		1.18E-1	5.28E-2	2.10	
ENGINE RAT		=	,	MMBtu/hr			4SRB	9.50E-3		2.27E+0		2.96E-2	2.05E-2	1.20	
BRAKE-SPE	-	_		Btu/			40110			98 Subpa		2.30L-2	2.002 2	GW	
FUEL CONS		=	8,000	HP-hr						Emission				N ₂ O=	298
CALCULATI		=	Contr		d Unconti	rollad				C-1 & C-2				CO ₂ =	1
EMISSION F		_			URER'S E					IMBtu)				CH ₄ =	25
(EF			Uncont		Contr				N ₂ O	CO ₂	CH ₄			01.14	
NO		=		g/HP-hr		g/HP-hr		Diesel	0.0006	75.04	0.003				
CC				g/HP-hr		g/HP-hr		NG A	0.0001	53.06	0.003				
VOC				g/HP-hr		g/HP-hr		LPG	0.0001	62.72	0.001				
CH ₂				g/HP-hr		g/HP-hr		Propane	0.0006	61.46	0.003				
CH			0.07	g/HP-hr	0.07	g/HP-hr		riopane	0.0000	01.40	0.003				
011	4	= C	ontrolled a	-	ntrolled 14	_	ne Fmis	ssions Cal	culations						
			ornir onload a	000.	in one i i	0 iii 2iigi		Joiono Gai	odia (iorio			Uncont	rolled	Contr	ollod
	0.0095	l h	1 10	MMBtu	8760 Hrs	1 Ton		0 -					Tons		Tons
PM -	0.0095 MMI		1.16 H		Year	2000 Lb	-	S.F.	- 4	-	=	Ye		Yea	
	IVIIVII	วเน	П	ſ	rear	2000 Lb						1e	ar	166	1 1
	0.0006	lb	1.16	MMBtu	8760 Hrs	1 Ton		S.F.	4.5	ppmv S		0.00	Tons	0.00	Tons
SO ₂	MMI		H		Year	2000 Lb				ppmv S	=	Ye	ar	Yea	ar
		- 10								-					
NO _x	13.48	g	145.00	HP	1 Lb	8,760	Hr	1 Ton		S.F.	_ =	18.87	Tons	1.40	Tons
ιιο _χ	HP-	Hr			453.6 g	Yea	ar	2000 Lb			_	Ye	ar	Yea	ar
	10.40	_	1 15 00	un	2.15	0.700	Lir	1 Ton		0.5		10.05	Tons	0.00	Tons
co	13.46 HP-	-	145.00	HP	1 Lb 453.6 g	8,760 Yea	BODODO.	2000 Lb		S.F.	=	Ye		Yea	
	пг-	П			455.0 g	160	عا ا	2000 LD				160	21	160	21
	0.22	g	145.00	HP	1 Lb	8,760	Hr	1 Ton		S.F.		0.31	Tons	0.28	Tons
voc	HP-	Hr			453.6 g	Yea	ar	2000 Lb			=	Ye	ar	Yea	ar
CH₂O	0.0700	1000	145.00	HP	1 Lb	8,760	Interested Pro-	1 Ton		S.F.			Tons		Tons
- 2-	HP-	Hr			453.6 g	Yea	ar	2000 Lb				Ye	ar	Yea	ar
non-CH₂O	0.0120	lh l	1 16	MMBtu		8.760	Hr	1 Ton		S.F.		0.06	Tons	0.06	Tons
HAPs	MMI	OCTOR OCTORIO	1.10 H	Antologia		7ea		2000 Lb		J.I .	=	Ye		Yea	
12.0	IVIIVI	Jiu J				700		2000 20							
00	1.16	MMBtu	53.06	kg	0.001 Me	etric Ton	8,760	Hr	1.10231	Tons		594.34	Tons	594.34	Tons
CO ₂	H		MMI	3tu	k	g	γ	'ear	1 M	Ton	=	Yea	ar	Yea	ar
N₂O		MMBtu	0.0001			etric Ton	-,		1.10231		=		Tons		Tons
-	H		MMI	3tu	k	g	}	ear/	1 M	Ton		Ye	ar	Yea	ar
	1 16	MMBtu	0.001	ka	0 001 1/4	etric Ton	8.760	Hr	1.10231	Tone		0.01	Tons	0.01	Tons
CH₄ -	H		MMI			g	,	/ear		Ton	=	Yes		Yea	
	111		1411411	_ (<u> </u>	<i>3</i>		Jui	, ,,,,			160		130	
	594.34	Tons		0.0011	Tons			0.0112	To	ns		594.35	Tons	594.35	Tons
Mass Sum	Ye	ar	+		ear	+			ear		=	Ye		Yea	
	CC				N ₂ O				CH₄						
					Ē.										
	594.34	TPY*1		0.0011	TPY*298			0.011	TP	/ *25	_	594.95	Tons	594.95	
CO ₂ e	594	34	+	0	.33	+		0	.28		=	Yea	ar	Yea	ar
	CC)2			N ₂ O				CH₄						

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LIFT-4

LIFI-4			1474				1								
		L	DATA:	10 10 0	ower Oil										
	.=									AP-42	Emission				
ENGINE TYP		=	4SF		N	G	T		00.1	NO	(lb/MMBtu	,	011.0		
FUEL HEAT		=	ĺ,	Btu/Scf			Туре	PM	SO ₂ ¹	NO _X	CO	VOC	CH ₂ O	Other I	
FUEL H2S C		=		ppmv			Diesel			4.41E+0		3.50E-1	1.18E-3	2.69	
MAXIMUM EN		=	163				2SLB	3.84E-2		3.17E+0		1.20E-1	5.52E-2	2.53	
ENGINE OP ENGINE RAT		=	8,760				4SLB			4.08E+0		1.18E-1	5.28E-2	2.10	
	-	=	1.30	MMBtu/hi			4SRB			2.27E+0		2.96E-2	2.05E-2	1.20	
BRAKE-SPE		=	8,000	Btu/ HP-hr						98 Subpa Emission				GW	
CALCULATI								Greenin		C-1 & C-2	raciois			N ₂ O=	298
		=			<mark>d Unconti</mark> URER'S E					-				CO ₂ =	1 25
EMISSION F			Uncont		-					MBtu)	011			Сп₄=	25
					Contr	_		Disease	N ₂ O	CO ₂	<u>CH₄</u>				
NO		=		g/HP-hr		g/HP-hr		Diesel	0.0006	75.04	0.003				
CC		=		g/HP-hr	2	g/HP-hr		NG	0.0001	53.06	0.001				
VO		=		g/HP-hr		g/HP-hr		LPG	0.0006	62.72	0.003				
CH ₂		=		g/HP-hr		g/HP-hr	-	Propane	0.0006	61.46	0.003				
СН	4	=		g/HP-hr		g/HP-hr	4.								
		C	ontrolled a	na Unco	ntrolled 16	3 HP Engi	ne Emis	ssions Cal	culations	,					<u> </u>
												Uncon		Contro	
PM	0.0095				8760 Hrs		4	S.F.	A		=	Hedeleles.	Tons		Tons
	MMI	3tu	H	<u> </u>	Year	2000 Lb		A				Ye	ar	Yea	ar
	0.0006	lh	1 20	MMBtu	8760 Hrs	1 Ton		S.F.	6.16667	nnmu C		0.01	Tons	0.01	Tons
SO ₂					Year	2000 Lb		З. Г.	A INTERPOSED .		=	Ye		Yea	
	MMI	วเน 	H		rear	2000 LD			3.44	ppmv S		16	aı	160	aı
	13.5	g	163.00	HP	1 Lb	8,760	Hr	1 Ton		S.F.		21.25	Tons	0.79	Tons
NO _X	HP-	_			453.6 g	Yea	760	2000 Lb			=	Ye	ar	Yea	ar
co	17	g	163.00	HP	1 Lb	8,760	Hr	1 Ton		S.F.	_	26.76	Tons	3.15	Tons
00	HP-	Hr			453.6 g	Yea	ar	2000 Lb			_	Ye	ar	Yea	ar
	0.05	-	100.00	ı in		0.700	110	1 Tan		0.5		0.55	Tana	0.55	T
voc	0.35		163.00	HP	1 Lb	8,760	7000	1 Ton		S.F.	=	Ve:	Tons	V.55	Tons
	HP-	Hr			453.6 g	Yea	ar	2000 Lb				Te	ar	165	a (
	0.0500	a I	163.00	HP	1 Lb	8.760	Hr	1 Ton		S.F.		0.08	Tons	0.08	Tons
CH ₂ O	HP-				453.6 g	Yea	foliolioliolio-	2000 Lb			=	Ye	ar	Yea	
non-CH ₂ O	0.0120	lb	1.30	MMBtu		8,760	Hr	1 Ton		S.F.	_	0.07	Tons	0.07	Tons
HAPs	MMI	3tu	H			Yea	ar	2000 Lb			_	Ye	ar	Yea	ar
		MADE					0.700			_			_		_
CO ₂		MMBtu	53.06	_		etric Ton	,		1.10231		=	668.12		668.12	
	H		MME	3tu	l k	g	Y	ear ear	1 M	Ton		Ye	ar	Yea	ar
	1.30	MMBtu	0.0001	ka	0 001 M	etric Ton	8.760	Hr	1.10231	Tons		0.00	Tons	0.00	Tons
N ₂ O	1.00 H		MME	D	6.001 l/k			/ear		Ton	=	Ye		Yea	
				Stu .	^	9			_ · · · · ·	1011					
CH₄	1.30	MMBtu	0.001	kg	0.001 Me	etric Ton	8,760	Hr	1.10231	Tons		0.01	Tons	0.01	Tons
СП4	H	r	MME	3tu	k	g	γ	'ear	1 M	Ton	=	Ye	ar	Yea	ar
	668.12		+	0.0013		+		0.0126		ns		668.13		668.13	
Mass Sum	Ye		•		ear			Y	'ear			Yea	ar	Yea	ar
	CC) ₂			N ₂ O			(CH₄						
	000 10	TD\#4		0.0010	TD\#000			0.010	TO	/*OF			_		_
	668.12				TPY*298	+		0.013		Y*25	=	668.81		668.81	
CO ₂ e	668.		+		.38				0.31			Yea	ar	Yea	ar
	CC) 2			N ₂ O			(CH₄						

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GEN-4

GEN-4			DATA:												
		Ī		13 Gener	rator (GEN	-4)				ΛD-42	Emission	Factors			
ENGINE TYP)F	=	4SF		•	G				AI -72	(lb/MMBtu				
FUEL HEAT		=	,	Btu/Scf		u	Туре	РМ	SO ₂ 1	NO _x	CO	voc	CH ₂ O	Other	ΠΛDc
FUEL H2S C				ppmv					_	4.41E+0		3.50E-1	1.18E-3	2.69	
MAXIMUM EN	-	=		HP			2SLB			3.17E+0		1.20E-1	5.52E-2	2.53	
ENGINE OP		=	8,760				4SLB	7.71E-5	5.88E-4			1.18E-1	5.28E-2	2.10	
ENGINE RAT		=		MMBtu/hr			4SRB				3.72E+0		2.05E-2	1.20	
BRAKE-SPE	-	_	7				43ND					2.90L-2	2.00L Z	GW	
FUEL CONS		=	8,000	Btu/ HP-hr						98 Subpa Emission				N ₂ O=	298
CALCULATI		=	Cambu		<mark>d Unconti</mark>	ام داام				C-1 & C-2				CO ₂ =	1
EMISSION F					URER'S E					IMBtu)				CH ₄ =	25
(EF			Uncont		Contr				N ₂ O	CO ₂	CH₄			0114=	25
NO NO		=		g/HP-hr		g/HP-hr		Diesel	0.0006	75.04	0.003				
CC								NG		53.06					
VO		=		g/HP-hr g/HP-hr	'	g/HP-hr		LPG	0.0001	HOSPIGA.	0.001				
		=				g/HP-hr			0.0006	62.72	0.003				
CH ₂		=	0.1	g/HP-hr		g/HP-hr		Propane	0.0006	61.46	0.003				
CH	4	=)	g/HP-hr		g/HP-hr	-4	-1 O-1-							
			ontrolled	and Unco	ntrolled 68	HP Engir	ie Emis	sions Caid	ulations						<u>.</u>
												Uncon		Contr	
PM	0.0095				8760 Hrs		4	S.F.	4		=	Hoolookookook	Tons		Tons
	MMI	3tu	Н	r	Year	2000 Lb				P		Ye	ar	Yea	ar
	0.0006	lh	0.54	MMBtu	8760 Hrs	1 Ton		S.F.	6.16667	nnmy C		0.00	Tons	0.00	Tons
SO ₂			0.54 H		Year	2000 Lb		З. Г.	101001001000		=	Ye		Yea	
	MMI	วเน	п	ſ	rear	2000 LD			3.44	ppmv S		16	21	160	aı
	14.4	g	68.00	HP	1 Lb	8.760	Hr	1 Ton		S.F.		9.46	Tons	0.33	Tons
NO _X	HP-	-			453.6 g	Yea	100	2000 Lb			=	Ye	ar	Yea	ar
СО	16.3	g	68.00	HP	1 Lb	8,760	Hr	1 Ton		S.F.	_	10.70	Tons	0.66	Tons
00	HP-	Hr			453.6 g	Yea	ar	2000 Lb			=	Ye	ar	Yea	ar
								. =					_		_
voc	0.50	-	68.00	HP	1 Lb	8,760	1000	1 Ton		S.F.	=		Tons		Tons
	HP-	Hr	b-		453.6 g	Yea	ar	2000 Lb				Ye	ar	Yea	ar
	0.1000	a 1	68.00	HP	1 Lb	8.760	Hr	1 Ton		S.F.		0.07	Tons	0.07	Tons
CH ₂ O	0.1000 HP-		00.00	111	453.6 g	7ea	Edological Car	2000 Lb		J.1 .	=	Ye		Yea	
		' "			455.0 g	766	ar .	2000 20				10.	41		u 1
non-CH₂O	0.0120	lb	0.54	MMBtu		8,760	Hr	1 Ton		S.F.		0.03	Tons	0.03	Tons
HAPs	MMI	3tu	Н	r		Yea	ar	2000 Lb			=	Yea	ar	Yea	ar
CO ₂	***	MMBtu	53.06	_	0.001 Me	etric Ton	8,760	Hr	1.10231	Tons	_	278.72		278.72	
302	H	r	MMI	3tu	k	g	γ	ear/	1 M	Ton		Ye	ar	Yea	ar
	0.54	MANADA	0.0004		1 0 004 44		0.700			-			T		T
N ₂ O		MMBtu	0.0001	400000		etric Ton	-,		1.10231		=		Tons		Tons
	H	r	ММ	3tu	K	g	Y	ear ear	1 M	Ton		Yea	ar	Yea	ar
	0.54	MMBtu	0.001	ka	0.001 Me	etric Ton	8,760	Hr	1.10231	Tons		0.01	Tons	0.01	Tons
CH₄	H		MMI	_		g	-	′ear		Ton	=	Ye		Yea	
									1						
	278.72	Tons		0.0005	Tons			0.0053	To	ns		278.73	Tons	278.73	Tons
Mass Sum	Ye		+		ear	+		Y	ear		=	Ye		Yea	
	CC				N ₂ O				OH₄						
					2 -				-						
	278.72	TPY*1		0.0005	TPY*298			0.005	TP	/ *25		279.01	Tons	279.01	Tons
CO ₂ e	278.	.72	+	0	.16	+		C	.13		=	Ye	ar	Yea	ar
	CC	`			N ₂ O			,	CH₄						

¹ EPA AP-42 factors assume gas to have 2000 gr S/MMScf (at EPA STP). This equates to 3.44 ppmv S, assuming ideal gas. AP-42 factor can be corrected to sulfur value of facility gas by comparing actual sulfur values to EPA reference point. Assume ppmv H₂S = ppmv S (true if H₂S = TRS and TRS is entirely monosulfur compounds).

LIFT-5

	-		DATA:												
			14-	XX Powe	r Oil (LIFT-	4)				AP-42	Emission	Factors			
ENGINE TYP	Έ	=	4SF	RB	N	G					(lb/MMBtu	1)			
FUEL HEAT	CONTENT	=	,	Btu/Scf			Туре	PM	SO ₂ ¹	NO _x	co	voc	CH ₂ O	Other I	HAPs
FUEL H2S C	ONTENT	=	6.2	ppmv			Diesel	3.10E-1	[By Mass]	4.41E+0	9.50E-1	3.50E-1	1.18E-3	2.691	E-3
MAXIMUM EN	IGINE HP	=	163	• •			2SLB	3.84E-2	5.88E-4	3.17E+0		1.20E-1	5.52E-2	2.531	E-2
ENGINE OP	HOURS	=	8,760				4SLB	7.71E-5	5.88E-4	4.08E+0		1.18E-1	5.28E-2	2.10	E-2
ENGINE RAT	ΓING	=	1.30	MMBtu/hr			4SRB	9.50E-3	5.88E-4	2.27E+0	3.72E+0	2.96E-2	2.05E-2	1.201	E-2
BRAKE-SPE	CIFIC		•	Btu/				40		98 Subpa				GW	'P
FUEL CONS		=	8,000	HP-hr						Emission				N ₂ O=	298
CALCULATI	ON BASIS	=	Contr	olled and	d Uncontr	olled			Tables C	C-1 & C-2				CO ₂ =	1
EMISSION F	ACTORS				URER'S E				(kg/N	IMBtu)				CH ₄ =	25
(EF			Uncont	rolled	Contr	olled			N ₂ O	CO ₂	CH ₄				
NO)x	=	13.5	g/HP-hr	0.5	g/HP-hr		Diesel	0.0006	75.04	0.003				
CC		=		g/HP-hr		g/HP-hr		NG A	0.0001	53.06	0.001				
VO	С			g/HP-hr	_	g/HP-hr		LPG	0.0006	62.72	0.003				
CH ₂		=		g/HP-hr		g/HP-hr		Propane	0.0006	61.46	0.003				
CH		=		g/HP-hr		g/HP-hr		Порашо	0.000	01.10	0.000				
011					ntrolled 16	<u> </u>	l ne Emis	sions Cal	culations						
		1	Silod b		554 70	- yı		541	- 2.2.10113			Uncon	rolled	Contro	المط
	0.0095	l h	1 20	MMBtu	8760 Hrs	1 Ton		C E					Tons		Tons
PM			1.30 H		Year	2000 Lb		S.F.	-A		= "	Ye		Yea	
	MMI	วเน	п	<u> </u>	rear	2000 LD						1e	ar	165	1 1
	0.0006	lb	1.30	MMBtu	8760 Hrs	1 Ton		S.F.	6.16667	ppmy S		0.01	Tons	0.01	Tons
SO ₂	MMI		H		Year	2000 Lb		0	101001001000	ppmv S	=	Ye		Yea	
				•					3.1.	pp 0					
NO _x	13.5	g	163.00	HP	1 Lb	8,760	Hr	1 Ton	1	S.F.		21.25	Tons	0.79	Tons
ΝΟχ	HP-	Hr			453.6 g	Yea	ar	2000 Lb		AP	_	Ye	ar	Yea	ar
			4					4.7					_		_
со	17		163.00	HP	1 Lb	8,760	10010010	1 Ton		S.F.	_		Tons		Tons
	HP-	Hr			453.6 g	Yea	ar	2000 Lb				Ye	ar	Yea	ar
	0.35	a	163.00	НР	1 Lb	8.760	Hr	1 Ton		S.F.		0.55	Tons	0.55	Tons
voc	HP-		100.00		453.6 g	Yea	1000	2000 Lb		0.1 .	=	Ye		Yea	
	- 111				100.0 9	,,,	41	2000 20							
011.0	0.0500	g	163.00	HP	1 Lb	8,760	Hr	1 Ton		S.F.		0.08	Tons	0.08	Tons
CH ₂ O	HP-	Hr			453.6 g	Yea	ar	2000 Lb			=	Ye	ar	Yea	ar
non-CH ₂ O	0.0120	lb		MMBtu		8,760		1 Ton		S.F.	_		Tons		Tons
HAPs	MMI	3tu	Н	r		Yea	ar	2000 Lb				Ye	ar	Yea	ar
	1 00	MMBtu	F0.00	La	0 001 14	etric Ton	8,760	Lle	4 40004	Tana		CC0 40	Tono	668.12	Tono
CO ₂	1.30 Hi		53.06	-	10200000000 1020000000		-		1.10231	Ton	=	668.12 Yes		908.12 Yea	
	н		MMI	วเน	J	g	Y	'ear	I IVI	TON		Te	ar	rea	a i
	1.30	MMBtu	0.0001	ka	0.001 Me	etric Ton	8,760	Hr	1.10231	Tons		0.00	Tons	0.00	Tons
N ₂ O	H		MMI		k		-	'ear		Ton	=	Ye		Yea	
CH₄	1.30	MMBtu	0.001	kg	0.001 Me	etric Ton	8,760	Hr	1.10231	Tons	_	0.01	Tons	0.01	Tons
CI 14	H	,	MMI	3tu	k,	g	γ	'ear	1 M	Ton	=	Ye	ar	Yea	ar
	668.12	Tons	+	0.0013		<i>+</i>		0.0126		ns		668.13		668.13	
Mass Sum	Yea				ear			Y	ear			Ye	ar	Yea	ar
	CC)2			N ₂ O				CH₄						
	660.10	TDV*4		0.0010	TDV*000			0.010	TO	/*OF			T		
	668.12				TPY*298	+		0.013		/*25	=	668.81		668.81	
CO ₂ e	668.		+		.38				.31			Yea	ar	Yea	ar
	CC)2		- 1	N ₂ O			(CH₄						

¹ EPA AP-42 factors assume gas to have 2000 gr S/MMScf (at EPA STP). This equates to 3.44 ppmv S, assuming ideal gas. AP-42 factor can be corrected to sulfur value of facility gas by comparing actual sulfur values to EPA reference point. Assume ppmv H₂S = ppmv S (true if H₂S = TRS and TRS is entirely monosulfur compounds).

GEN-5

			ATA:												
			14-)	XX Genei	rator (GEN	-5)				AP-42	Emission	Factors			
ENGINE TYP		=	4SR		N	G					(lb/MMBtu	1)			
FUEL HEAT		=		Btu/Scf			Туре	PM	SO ₂ ¹	NO _x	со	voc	CH ₂ O	Other I	
FUEL H2S C		=	6.17	ppmv			Diesel	3.10E-1	[By Mass	4.41E+0	9.50E-1	3.50E-1	1.18E-3	2.69	
MAXIMUM EN		=	68				2SLB		5.88E-4			1.20E-1	5.52E-2	2.53	
ENGINE OP		=	8,760				4SLB		5.88E-4			1.18E-1	5.28E-2	2.10	
ENGINE RAT	-	=	0.54	MMBtu/hr			4SRB	9.50E-3		2.27E+0		2.96E-2	2.05E-2	1.20	
BRAKE-SPE		=		Btu/ HP-hr						98 Subpa				GW	
FUEL CONS								Greenn		Emission	ractors			N ₂ O=	298
CALCULATI		=			d Unconti					C-1 & C-2				CO ₂ =	1
EMISSION F					URER'S E					MBtu)				CH₄=	25
(EF			Unconti		Contr	_		D: 1	N₂O	CO ₂	<u>CH₄</u>				
NO		=		g/HP-hr		g/HP-hr		Diesel	0.0006	75.04	0.003				
CC		=		g/HP-hr	1	g/HP-hr		NG	0.0001	53.06	0.001				
VO		=		g/HP-hr		g/HP-hr		LPG	0.0006	62.72	0.003				
CH ₂		=		g/HP-hr		g/HP-hr		Propane	0.0006	61.46	0.003				
СН	4	=	ontrolled a	g/HP-hr	ntrolled 69	g/HP-hr	o Emis	sions Cale	ulatione						
		-	ontrolled	ina onco	iiti olled oc	i ir Eigii	ie Lilis	Sions Care	Julations	1		Uncont	ualla d	Contro	امطا
	0.0005	l h	0.54	MANADA	8760 Hrs	1 Ton		0.5					Tons		
PM	0.0095 MMI		0.54 Hr		Year	2000 Lb	4	S.F.	4	-	= **	Yea		Yea	Tons
	IVIIVII	วเน	П		rear	2000 LD						16	aı	160	a i
20	0.0006	lb	0.54	MMBtu	8760 Hrs	1 Ton		S.F.	6.16667	ppmv S		0.00	Tons	0.00	Tons
SO ₂	MMI	3tu	Hr		Year	2000 Lb			Delectrostono.	ppmv S	=	Yea	ar	Yea	ar
NO _x	14.4	_	68.00	HP	1 Lb	8,760	700	1 Ton	-	S.F.	=		Tons		Tons
	HP-	Hr			453.6 g	Yea	ar	2000 Lb				Yea	ar	Yea	ar
	16.3	n	68.00	HP	1 Lb	8.760	Hr	1 Ton		S.F.		10 70	Tons	0.66	Tons
co	HP-	-	00.00		453.6 g	Yea	ROSPOSION,	2000 Lb		0.1 .	=	Yea		Yea	
					100.0 9			2000 20							
voc	0.50	g	68.00	HP	1 Lb	8,760	Hr	1 Ton		S.F.		0.33	Tons	0.33	Tons
700	HP-	Hr	4		453.6 g	Yea	ar	2000 Lb			_	Yea	ar	Yea	ar
	0.4000		00.00	LID.	4 (5	8.760	Lle	1 Ton		0.5		0.07	Tons	0.07	Tons
CH ₂ O	0.1000 HP-		68.00	HP	1 Lb 453.6 g	8,760 Yea	Introduction"	2000 Lb		S.F.	=	Yea		Yea	
		[]]			455.0 g	160	ai	2000 LD				160	aı .	166	a1
non-CH₂O	0.0120	lb	0.54	MMBtu		8,760	Hr	1 Ton		S.F.		0.03	Tons	0.03	Tons
HAPs	MMI	3tu	Hr	. 4		Yea	ar	2000 Lb			=	Yea	ar	Yea	ar
		MME			000155		0			_			_		_
CO ₂		MMBtu	53.06			etric Ton	,		1.10231		=	278.72		278.72	
	H		MME	3tu	K	g	Y	'ear	1 M	Ton		Yea	ar	Yea	ar
	0.54	MMBtu	0.0001	ka	0.001 Me	etric Ton	8,760	Hr	1.10231	Tons		0.00	Tons	0.00	Tons
N₂O	H		MME		k			'ear		Ton	=	Yea		Yea	
CH₄	****	MMBtu	0.001	kg	0.001 Me		8,760		1.10231		_		Tons		Tons
V	H	•	MME	3tu	k	g	γ	'ear	1 M	Ton		Yea	ar	Yea	ar
	070.70	Tons		0.0005	Tons			0.0050				070.70	Tone	070.70	Tons
Mass Sum	278.72 Ye	Tons	+ -	0.0005		+		0.0053	ear	ns	=	278.73 Yea		278.73 Yea	
wass Suiil	CC				ear N O							160	u 1	100	41
		/2		l	N₂O				CH₄						
	278.72	TPY*1		0.0005	TPY*298			0.005	TP	Y*25		279.01	Tons	279.01	Tons
CO₂e	278	72	+	0	.16	+		C).13		=	Yea		Yea	
_	CC)2			N ₂ O			(CH₄						

¹ EPA AP-42 factors assume gas to have 2000 gr S/MMScf (at EPA STP). This equates to 3.44 ppmv S, assuming ideal gas. AP-42 factor can be corrected to sulfur value of facility gas by comparing actual sulfur values to EPA reference point. Assume ppmv H₂S = ppmv S (true if H₂S = TRS and TRS is entirely monosulfur compounds).

Heater Treater at 24-1

Data:					Al	P-42 EF (Propane)	Based on	NG with E	Stu/Conten	t of 1020	
I ₂ S mol%	0.00%	mol%			PM=	7.6	Lb/MMScf		GWI	P*	*Revised 11	/29/201
p Hours	8760	Hrs			NO _X =	150	Lb/MMScf		N ₂ O=	298		
eat Content	2,500	Btu/scf (Ind.)		CO=	84	Lb/MMScf		CO ₂ =	1		
lowrate	0.200	MScf/Hr	(Ind.)		VOC=	5.5	Lb/MMScf		CH ₄ =	25		
eat Input	500,000	Btu/hr			HAP=	1.89	Lb/MMScf					
Jse btu/scf(EP	A) for PM, NO	, CO, VO	C. Factors		SO ₂ =	0.60	Lb/MMScf					
or EPA STP (al	so ADEM STP)	. SO2 fac	or already			Table C-	1 & C-2)	(Ta	able C-1 & C	2-2)		
for Industry	STP(fromAI.	Oil & Gas	Board)				8 Sub C GHG		Part 98 Sub			
nd. STP:	60	°F	14.65	psia	Emis	ssion Fa	ctors for C ₃	Emiss	ion Factors	for C ₁		
PA STP:	68	°F	14.696	psia	N ₂ 0=		kg/MMBtu	N ₂ 0=	0.0001	kg/MMBtu		
leat Content	2,470	Btu/scf (EPA)		CO ₂ =	61.46	kg/MMBtu	CO ₂ =	53.06	kg/MMBtu		
uel HHV Corr	ection Factor	2.421			CH₄=	0.003	kg/MMBtu	CH ₄ =	0.001	kg/MMBtu		
					Heater	Emissio	n Calculation	ns				
Pollutants												
	7.6	Lb	0.500	MMBtu	Scf (I	EPA)	8,760 Hr	1 Ton	2.421		0.016	Tons
PM	MMScf (E			Hr	2,470	Btu	Year	2,000 Lb				ar
	(,			2,			2,000 20				
	0.60	Lb	0.500	MMBtu	Scf (I	EPA)	8,760 Hr	1 Ton	2.421		0.001	Tons
SO ₂	MMScf (E	EPA)		Hr	2,470	Btu	Year	2,000 Lb		=	Ye	ar
		, , , , , , , , , , , , , , , , , , ,						,				
NO	150	Lb	0.500	MMBtu	Scf (I	EPA)	8,760 Hr	1 Ton	2.421		0.322	Tons
NO _X	MMScf (E	EPA)		Hr	2,470	Btu	Year	2,000 Lb			Ye	ar
							1					
00	84	Lb	0.500	MMBtu	Scf (I	EPA)	8,760 Hr	1 Ton	2.421		0.180	Tons
СО	MMScf (E	EPA)		Hr	2,470	Btu	Year	2,000 Lb		=	Ye	ar
voc	5.5	Lb	0.500	MMBtu	Scf (I	EPA)	8,760 Hr	1 Ton	2.421	=	0.012	Tons
VOC	MMScf (E	EPA)		Hr	2,470	Btu	Year	2,000 Lb			Ye	ar
HAP	1.89	Lb	0.500	MMBtu	Scf (I	EPA)	8,760 Hr	1 Ton	2.421		0.004	Tons
IIA	MMScf (E	EPA)		Hr	2,470	Btu	Year	2,000 Lb		_	Ye	ar
CO ₂	0.5	MMBtu	61.46	kg	0.001 Me	etric Ton	8,760 Hr	1.1023	3 Tons		296.73	
30 2	Hr		M	MBtu	k	g	Year	1 Metr	ic Ton		Ye	ar
N₂O	0.5	MMBtu	0.0006	kg	0.001 Me	etric Ton	8,760 Hr	1.1023	3 Tons		0.00290	
1.20	Hr		M	MBtu	k	g	Year	1 Metr	ic Ton		Ye	ar
CH₄	- Ville	MMBtu	0.003	Ventorio (n. 1	0.001 Me		-,	1.1023			0.01448	
	Hr		M	MBtu	k	g	Year	1 Metr	ic Ton		Ye	ar
		000 70	-		0.000) T		0.04.45	-			_
		296.73	Ions	+		9 Tons	+	0.0145		=	296.75	
Mass Sum		Year			Ye			Ye	ar		Ye	ar
		CO ₂			N	I ₂ O		CH ₄				
						0 75):	V 225			V		
	296.73		X 1		0.002	9 TPY	X 298	0.0145		X 25 =	297.96	
CO₂e	2	296.73		+		0.86	+		0.36		Ye	ar
		CO ₂				N ₂ O			CH ₄			

¹ AP-42 emission factors taken from Chapter 1.4. Based on natural gas with 1020 btu/scf, and corrected in calculations. From Chapter 1.5, propane emission factors are equivalent on a heat basis to methane factors, except the NO_X factor is 1.5x higher.

Line Heater at 24-1

Data:					AF	-42 EF	(Propago)	٦.	Dacad ar	NC with D	tu/Conton	t of 1020	
Jata: H ₂ S mol%	0.000/	m alo/			PM=		(Propane)		based on		Stu/Conten		
	0.00%	mol%				7.6	Lb/MMScf			GWI		*Revised 11	/29/201
p Hours	8760	Hrs	II \		NO _X =	150	Lb/MMScf			N ₂ O=	298		
eat Content	2,500	Btu/scf (,		CO=	84	Lb/MMScf			CO ₂ =	1		
lowrate	0.300	MScf/Hr	(Ind.)		VOC=	5.5	Lb/MMScf			CH ₄ =	25		
eat Input	750,000	Btu/hr			HAP=	1.89	Lb/MMScf						
Jse btu/scf(EP	A) for PM, NOx	, CO, VO	C. Factors		SO ₂ =	0.60	Lb/MMScf						
	so ADEM STP).					Table C	-1 & C-2)		(Ta	ble C-1 & C	C-2)		
	STP (from Al.				40 CF	R Part 9	8 Sub C GHG	i	40 CFR	Part 98 Sub	C GHG		
nd. STP:	60		14.65	•			ctors for C ₃			on Factors			
PASTP:	68		14.696	psia	N ₂ 0=		kg/MMBtu	1	N ₂ 0=		kg/MMBtu		
eat Content	2,470	Btu/scf (EPA)		CO ₂ =		kg/MMBtu	(CO ₂ =		kg/MMBtu		
uel HHV Corre	ection Factor	2.421			CH ₄ =		kg/MMBtu	- 4	CH ₄ =	0.001	kg/MMBtu		
					Heater	Emissio	on Calculat	tions					
Pollutants													
	7.6	Lb	0.750	MMBtu	Scf (E	EPA)	8,760 H	lr	1 Ton	2.421		0.024	Tons
PM -	MMScf (E	PA)		Hr	2,470	Btu	Year	107	2.000 Lb				ar
		,			_,,,,,			\dashv	_,000 LD				
	0.60	Lb	0.750	MMBtu	Scf (E	EPA)	8,760 H	lr	1 Ton	2.421		0.002	Tons
SO ₂	MMScf (E	PA)		Hr	2,470	Btu	Year		2,000 Lb		=	Ye	ar
		,			1 =,				2,000 20				
	150	Lb	0.750	MMBtu	Scf (E	EPA)	8,760 H	lr .	1 Ton	2.421		0.483	Tons
NO _X	MMScf (E			Hr	2,470	Btu	Year	- 3	2.000 Lb		=		ar
		,		• • •	2,470		100.		2,000 LD				-
	84	Lb	0.750	MMBtu	Scf (E	EPA)	8,760 H	ır I	1 Ton	2.421		0.271	Tons
co	MMScf (E			Hr	2,470	Btu	Year	A01001001 0	2,000 Lb				ar
		,		•••	2,370	71	100.		2,000 Lb				
	5.5	Lb	0.750	MMBtu	Scf (E	EPA)	8,760 H	lr	1 Ton	2.421		0.018	Tons
voc	MMScf (E			Hr	2,470	Btu	Year		2,000 Lb				ar
		,			2,170	-	100		2,000 20				-
	1.89	Lb	0.750	MMBtu	Scf (E	EPA)	8,760 H	lr	1 Ton	2.421		0.006	Tons
HAP	MMScf (E	PA)		Hr	2,470	Btu	Year		2.000 Lb				ar
		,			2,170	11	14.11		2,000 20				
	0.75	MMBtu	61.46	kg	0.001 Me	tric Ton	8,760 H	lr	1.1023	Tons		445.10	Tons
CO ₂	Hr		- 1	MBtu	kç	1	Year		1 Metri	c Ton			ar
							-						
	0.75	MMBtu	0.0006	kg	0.001 Me	tric Ton	8,760 H	lr	1.1023	Tons		0.00435	Tons
N ₂ O	Hr		70010101010	MBtu	kç	י	Year		1 Metri	c Ton			ar
						,							
	0.75	MMBtu	0.003	kg	0.001 Me	tric Ton	8,760 H	lr	1.1023	Tons		0.02173	Tons
CH₄ -	Hr		М	MBtu	kç	1	Year		1 Metri	c Ton			ar
					1	,							
		445.10	Tons	+	0.0043	3 Tons	+		0.0217	Tons		445.13	Tons
Mass Sum		Year			Ye	ar			Yea	ar		Ye	ar
						₂ O			CH ₄				
		CO ₂			IN IN	20			СП4				
	445.10	TPY	X 1		0.004	3 TPY	X 298	-	0.0217	TPY	X 25	446.94	Tons
CO₂e		45.10			0.001	1.29			0.0217	0.54	=		ar
OU OC	4	.0.10		+		1.23		+		J.J-F		16	

¹ AP-42 emission factors taken from Chapter 1.4. Based on natural gas with 1020 btu/scf, and corrected in calculations. From Chapter 1.5, propane emission factors are equivalent on a heat basis to methane factors, except the NO_X factor is 1.5x higher.

Heater Treater at 13-11

Data:						AP-42 I	EF (NG)	Based on	NG with 8	Stu/Conten	t of 1020	
l₂S mol%	0.00%	mol%			PM=	7.6	Lb/MMScf		GW		*Revised 13	1/29/2013
p Hours	8760	Hrs			NO _X =	100	Lb/MMScf		N ₂ O=	298		
eat Content	1,462	Btu/scf (I	lnd.)		CO=	84	Lb/MMScf		CO ₂ =	1		
owrate	0.342	MScf/Hr	(Ind.)		VOC=	5.5	Lb/MMScf		CH ₄ =	25		
eat Input	500,000	Btu/hr			HAP=	1.89	Lb/MMScf					
lse btu/scf(EP	A) for PM, NOx	, CO, VO	C. Factors		SO ₂ =	0.60	Lb/MMScf					
	so ADEM STP)				(Table C-	1 & C-2)	(Т	able C-1 & 0	C-2)		
-	STP (from Al.						8 Sub C GHG		Part 98 Sul			
nd. STP: :PA STP:	60 68		14.65	•			ctors for C ₃		ion Factors			
eat Content		Btu/scf (I	14.696	psia	N ₂ 0=		kg/MMBtu	N ₂ 0=		kg/MMBtu		
	· · · · · · · · · · · · · · · · · · ·		EPA)		CO ₂ =		kg/MMBtu	CO ₂ =	0.001	kg/MMBtu		
uel HHV Corre	ection Factor	1.416			CH ₄ =		kg/MMBtu on Calculation	CH ₄ =	0.001	kg/MMBtu		
Pollutants					ricater	Lillissic	ni Calculati	JIIS				
Poliularits					1 0 11							
PM	7.6			MMBtu	Scf (8,760 Hr		1.416	=	0.016	
	MMScf (E	PA)		Hr	1,444	Btu	Year	2,000 Lb			Ye	ear
	0.60	l h	0.500	MMBtu	Scf (EPA)	8,760 Hr	1 Ton	1.416		0.001	Tons
SO ₂	MMScf (E			Hr	1,444	Btu	Year	2,000 Lb	1.410	=		ear
	IVIIVIOCI (E	-1 7 9		• • • • • • • • • • • • • • • • • • • •	1,,,,,,	Dia	Tour	2,000 Lb			• • • • • • • • • • • • • • • • • • • •	,u.
	100	Lb	0.500	MMBtu	Scf (EPA)	8,760 Hr	1 Ton	1.416		0.215	Tons
NO _X	MMScf (E	PA)		Hr	1,444	Btu	Year	2,000 Lb		=	Ye	ear
со	84	Lb	0.500	MMBtu	Scf (EPA)	8,760 Hr	1 Ton	1.416		0.180	
00	MMScf (E	PA)		Hr	1,444	Btu	Year	2,000 Lb		_	Ye	ar
voc	5.5			MMBtu	Scf (8,760 Hr	400000	1.416	=	0.012	
	MMScf (E	PA)		Hr	1,444	Btu	Year	2,000 Lb			Ye	ear
	1.89	lh 4	0.500	MMBtu	Scf (EΡΔ	8,760 Hr	1 Ton	1.416		0.004	Tono
HAP	MMScf (E	- 10		Hr	1,444	Btu	Year	2,000 Lb	1.410	- =		ear
	IVIIVIOCI (L	-1 //)			1,444	Did	IGai	2,000 Lb				,uı
	0.5	MMBtu	53.06	kg	0.001 Me	etric Ton	8,760 Hr	1.102	3 Tons		256.18	Tons
CO ₂	Hr		M	MBtu	k	g	Year	1 Metr	ic Ton	- =		ear
N₂O	0.5	MMBtu	0.0001	kg	0.001 Me	etric Ton	8,760 Hr	1.102	3 Tons		0.00048	Tons
1420	Hr		M	MBtu	k	g	Year	1 Metr	ic Ton	_	Ye	ear
CH₄	0.5	MMBtu	0.001	Vocation and Co.	0.001 Me	etric Ton	8,760 Hr		3 Tons		0.00483	
	Hr		M	MBtu	k	g	Year	1 Metr	ic Ton		Ye	ear
		256.18	—		0.000	5 Tons		0.0040	т		05040	T
Mana Cum		450	TORS	+			+	0.0048			256.18 V	ear
Mass Sum		Year			_	ar			ar		16	al
		CO ₂			ı	I₂O		CH₄				
	256.18	TPY	X 1		0.000	5 TPY	X 298	0.0048	TPY	X 25	256.44	Tone
CO₂e		256.18	^ '	1	0.000	0.14			0.12	=		ear
00 ₂ e		CO ₂		+		N ₂ O	1	-	CH ₄		10	

¹ AP-42 emission factors taken from Chapter 1.4. Based on natural gas with 1020 btu/scf, and corrected in calculations. From Chapter 1.5, propane emission factors are equivalent on a heat basis to methane factors, except the NO_X factor is 1.5x higher.

Heater Treater 13-15

Data:						AP-42	EF (NG)	Based on	NG with E	Stu/Conten	t of 1020	
H₂S mol%	0.00%	mol%			PM=	7.6	Lb/MMScf		GW		*Revised 11	/29/201
p Hours	8760 I	Hrs			NO _X =	100	Lb/MMScf		N ₂ O=	298		
leat Content	1,359 I	Btu/scf (Ind.)		CO=	84	Lb/MMScf		CO ₂ =	1		
lowrate	0.368	MScf/Hr	(Ind.)		VOC=	5.5	Lb/MMScf		CH ₄ =	25		
leat Input	500,000	Btu/hr			HAP=	1.89	Lb/MMScf					
lse btu/scf.(FP	A) for PM, NOx,	CO VO	C Factors		SO ₂ =	0.60	Lb/MMScf					
,	so ADEM STP).				-	Table C	-1 & C-2)	(T:	able C-1 & 0	2-2)		
for Industry	STP (from Al. C	Oil & Gas	Board)		,		8 Sub C GHG		Part 98 Sul			
nd. STP:	60 '	°F	14.65	psia			ctors for C ₃		ion Factors			
PASTP:	68 °	°F	14.696	psia	N ₂ 0=	0.0006	kg/MMBtu	N ₂ 0=	0.0001	kg/MMBtu		
leat Content	1,342	Btu/scf (EPA)		CO ₂ =	61.46	kg/MMBtu	CO ₂ =	53.06	kg/MMBtu		
uel HHV Corr	ection Factor	1.316			CH ₄ =	0.003	kg/MMBtu	CH ₄ =	0.001	kg/MMBtu		
					Heater	Emissio	on Calculati	ons				
Pollutants												
	7.6 [Lb	0.500	MMBtu	Scf (F	EPA)	8,760 Hr	1 Ton	1.316		0.016	Tons
PM	MMScf (EI			Hr	1,342	Btu	Year	2.000 Lb		- =		ar
		. , ,			1,042		, Joan	2,000 ED				
	0.60	Lb	0.500	MMBtu	Scf (E	EPA)	8,760 Hr	1 Ton	1.316		0.001	Tons
SO ₂	MMScf (EI			Hr	1,342	Btu	Year	2,000 Lb		=		ar
		,			1,012	- 10	100.	2,000 25				-
	100 l	Lb	0.500	MMBtu	Scf (E	EPA)	8,760 Hr	1 Ton	1.316		0.215	Tons
NO _X	MMScf (EI	PA)		Hr	1,342	Btu	Year	2,000 Lb				ar
		,						2,000 20				
	84 I	Lb	0.500	MMBtu	Scf (E	EPA)	8,760 Hr	1 Ton	1.316		0.180	Tons
СО	MMScf (EI	PA)		Hr	1,342	Btu	Year	2.000 Lb		=	Ye	ar
	,											
V00	5.5 I	Lb	0.500	MMBtu	Scf (F	EPA)	8,760 Hr	1 Ton	1.316		0.012	Tons
voc	MMScf (El	PA)		Hr	1,342	Btu	Year	2,000 Lb		=	Ye	ar
			A			#						
HAP	1.89 I	Lb	0.500	MMBtu	Scf (E	EPA)	8,760 Hr	1 Ton	1.316		0.004	Tons
ПАР	MMScf (El	PA)		Hr	1,342	Btu	Year	2,000 Lb			Ye	ar
CO ₂	0.5	MMBtu	53.06	kg	0.001 Me	tric Ton	8,760 Hr	1.1023	3 Tons		256.18	Tons
002	Hr		М	MBtu	k	3	Year	1 Metr	ic Ton	_	Ye	ar
									_			
N₂O	0.5	MMBtu	0.0001	kg	0.001 Me	tric Ton	8,760 Hr	1.1023	3 Tons		0.00048	
2 -	Hr		М	MBtu	k	9	Year	1 Metr	ic Ton		Ye	ar
												_
CH₄	- VIII	MMBtu	0.001	- American	0.001 Me	100,					0.00483	
	Hr		М	MBtu	k	9	Year	1 Metr	ic Ton		Ye	ar
		0EC 10	T		0.000	5 Tons		0.0040	T		05040	T
		256.18	ions	+			+	0.0048		=	256.18	
Mass Sum		Year			Ye				ar		YE	ar
		CO ₂			N	l₂O		CH₄				
	050.46	TDV	V 4		0.000	E TOY	V 000	0.0075	TDV	V 05		_
	256.18		X 1		0.000		X 298	0.0048		X 25 =	256.44	
CO₂e	25	56.18		+		0.14	-	+	0.12		Ye	ar
		CO ₂				N ₂ O			CH ₄			

¹ AP-42 emission factors taken from Chapter 1.4. Based on natural gas with 1020 btu/scf, and corrected in calculations. From Chapter 1.5, propane emission factors are equivalent on a heat basis to methane factors, except the NO_X factor is 1.5x higher.

Heater Treater 18-13

ata:						AP-42	EF (NG)		Based on		Stu/Conten	t of 1020	
₂ S mol%	0.00%	mol%			PM=	7.6	Lb/MMScf			GWI	P*	*Revised 11	/29/2013
o Hours	8760	Hrs			NO _X =	100	Lb/MMScf			N ₂ O=	298		
eat Content	1,462	Btu/scf (Ind.)		CO=	84	Lb/MMScf			CO ₂ =	1		
owrate	0.342	MScf/Hr	(Ind.)		VOC=	5.5	Lb/MMScf			CH ₄ =	25		
eat Input	500,000	Btu/hr			HAP=	1.89	Lb/MMScf						
se btu/scf(EP	A) for PM, NO	, CO, VO	C. Factors		SO ₂ =	0.60	Lb/MMScf						
	so ADEM STP)				(Table C-	·1 & C-2)		(Ta	ble C-1 & C	C-2)		
	STP (from Al.				,		8 Sub C ['] GH	G		Part 98 Sub			
d. STP:	60		14.65	•			ctors for C	3		ion Factors			
PA STP:	68		14.696	psia	N ₂ 0=		kg/MMBtu		N ₂ 0=		kg/MMBtu		
eat Content	1,444	Btu/scf (EPA)		CO ₂ =		kg/MMBtu		CO ₂ =		kg/MMBtu		
el HHV Corre	ection Factor	1.416			CH ₄ =		kg/MMBtu		CH ₄ =	0.001	kg/MMBtu		
					Heater	Emissio	on Calcula	ition	S				
Pollutants													
DM	7.6	Lb	0.500	MMBtu	Scf (E	EPA)	8,760	Hr	1 Ton	1.416		0.016	Tons
PM	MMScf (E	PA)		Hr	1,444	Btu	Year		2,000 Lb		=	Ye	ar
SO ₂	0.60	Lb	0.500	MMBtu	Scf (E	EPA)	8,760	Hr	1 Ton	1.416		0.001	Tons
302	MMScf (E	PA)		Hr	1,444	Btu	Year		2,000 Lb		_	Ye	ar
NO _x	100	Lb	0.500	MMBtu	Scf (E	EPA)	8,760	Hr	1 Ton	1.416	_	0.215	Tons
.τοχ	MMScf (E	EPA)		Hr	1,444	Btu	Year		2,000 Lb		# _	Ye	ar
СО		Lb	0.500	MMBtu	Scf (E		8,760	,6[5]5	1 Ton	1.416		0.180	
	MMScf (E	PA)		Hr	1,444	Btu	Year	-	2,000 Lb			Ye	ar
		1 6	0.500	NANADa	Scf (E	EDA)	0.700	11	17.	1 110		0.040	-
voc	5.5			MMBtu			8,760	lane.	1 Ton	1.416	=	0.012	
	MMScf (E	:PA)	_4	Hr	1,444	Btu	Year		2,000 Lb	P		Ye	ar
	1.89	l b	0.500	MMBtu	Scf (F	EPA)	8,760	Hr	1 Ton	1.416		0.004	Tons
HAP	MMScf (E			Hr	1,444	Btu	Year		2.000 Lb		=		ar
					1,777		100		2,000 Lb				
	0.5	MMBtu	53.06	kg	0.001 Me	tric Ton	8,760	Hr	1.1023	Tons		256.18	Tons
CO ₂	Hr		M	MBtu	k		Year		1 Metri	c Ton	=	Ye	ar
N ₂ O	0.5	MMBtu	0.0001	kg	0.001 Me	tric Ton	8,760	Hr	1.1023	Tons		0.00048	Tons
IN ₂ O	Hr		M	MBtu	k	9	Year		1 Metri	c Ton		Ye	ar
CH₄	0.5	MMBtu	0.001	kg	0.001 Me	tric Ton	8,760	Hr	1.1023	Tons	_	0.00483	Tons
O1 14	Hr		M	MBtu	k	3	Year		1 Metri	c Ton	_	Ye	ar
						- 1 -							
		256.18	Tons	+		Tons	+		0.0048			256.18	
lass Sum		Year			Ye	ar			Ye	ar		Ye	ar
		CO ₂	4		N	l ₂ O			CH₄				
	256.18	TPV	X 1		0.000	5 TPV	X 298		0.0048	TPV	X 25	256.44	Tone
CO₂e		256.18	Λ Ι		0.000	0.14	7 230		0.0046		=		ar
	_	.00.10		+		U.14		+	1	0.12		1 te	al

¹ AP-42 emission factors taken from Chapter 1.4. Based on natural gas with 1020 btu/scf, and corrected in calculations. From Chapter 1.5, propane emission factors are equivalent on a heat basis to methane factors, except the NO_X factor is 1.5x higher.

Heater Treater at 14-9

Data:						AP-42 I	EF (NG)		Based on		t of 1020		
₂ S mol%	0.00%	mol%			PM=	7.6	Lb/MMScf			GWI	D*	*Revised 11	/29/201
o Hours	8760	Hrs			NO _X =	100	Lb/MMScf			N ₂ O=	298		
eat Content	1,462	Btu/scf	(Ind.)		CO=	84	Lb/MMScf	:		CO ₂ =	1		
lowrate	0.342	MScf/Hr	(Ind.)		VOC=	5.5	Lb/MMScf	:		CH ₄ =	25		
leat Input	500,000	Btu/hr			HAP=	1.89	Lb/MMScf						
Jse btu/scf(EP	A) for PM, NO	k, CO, VO	C. Factors		SO ₂ =	0.60	Lb/MMScf						
or EPA STP (al						Table C-	1 & C-2)		(Ta	ble C-1 & C	C-2)		
	STP (from Al.						8 Sub C ['] GH	IG	,	Part 98 Sub			
nd. STP:	60		14.65	•			ctors for C			ion Factors			
PASTP:		°F	14.696	psia	N ₂ 0=		kg/MMBtu		N ₂ 0=		kg/MMBtu		
leat Content	1,444	Btu/scf	(EPA)		CO ₂ =		kg/MMBtu		CO ₂ =	53.06	kg/MMBtu		
uel HHV Corr	ection Factor	1.416			CH ₄ =		kg/MMBtu		CH ₄ =	0.001	kg/MMBtu		
					Heater	Emissio	n Calcula	ation	IS				
Pollutants													
	7.6	Lb	0.500	MMBtu	Scf (EPA)	8,760	Hr	1 Ton	1.416		0.016	Tons
PM	MMScf (E			Hr	1,444	Btu	Year		2,000 Lb		=		ar
	,	,			.,				-,,,,,				
	0.60	Lb	0.500	MMBtu	Scf (EPA)	8,760	Hr	1 Ton	1.416		0.001	Tons
SO ₂	MMScf (E	EPA)		Hr	1,444	Btu	Year		2,000 Lb		=	Ye	ar
	,								· '				
NO	100	Lb	0.500	MMBtu	Scf (EPA)	8,760	Hr	1 Ton	1.416		0.215	Tons
NO _X	MMScf (E	EPA)		Hr	1,444	Btu	Year		2,000 Lb			Ye	ar
							-						
00	84	Lb	0.500	MMBtu	Scf (EPA)	8,760	Hr	1 Ton	1.416		0.180	Tons
СО	MMScf (E	EPA)		Hr	1,444	Btu	Year	. 1	2,000 Lb		=	Ye	ar
V00	5.5	Lb	0.500	MMBtu	Scf (EPA)	8,760	Hr	1 Ton	1.416		0.012	Tons
voc	MMScf (E	EPA)		Hr	1,444	Btu	Year		2,000 Lb		=	Ye	ar
			A				All						
HAP	1.89	Lb	0.500	MMBtu	Scf (EPA)	8,760	Hr	1 Ton	1.416		0.004	Tons
ПАР	MMScf (E	EPA)		Hr	1,444	Btu	Year		2,000 Lb		=	Ye	ar
CO ₂	0.5	MMBtu	53.06	kg	0.001 Me	etric Ton	8,760	Hr	1.1023	3 Tons		256.18	Tons
CO ₂	Hr		M	MBtu	k	g	Year		1 Metri	ic Ton		Ye	ar
N₂O	0.5	MMBtu	0.0001	kg	0.001 Me	etric Ton	8,760	Hr	1.1023	Tons		0.00048	Tons
1120	Hr		M	MBtu	k	g	Year	•	1 Metri	c Ton	_	Ye	ar
CH₄	0.5	MMBtu	0.001	kg	0.001 Me	etric Ton	8,760	Hr	1.1023	Tons		0.00483	Tons
O1 14	Hr		M	MBtu	k	g	Year	•	1 Metri	ic Ton	_	Ye	ar
		256.18	Tons	+	0.000	5 Tons	+		0.0048	Tons		256.18	Tons
Mass Sum		Year			Ye	ar			Ye	ar		Ye	ar
		CO ₂			1	I₂O			CH₄				
	256.18	TPY	X 1		0.000	5 TPY	X 298		0.0048	TPY	X 25	256.44	Tons
CO₂e	2	256.18		+		0.14		+		0.12	=	Ye	ar
2-	CO ₂					N₂O				CH₄			

¹ AP-42 emission factors taken from Chapter 1.4. Based on natural gas with 1020 btu/scf, and corrected in calculations. From Chapter 1.5, propane emission factors are equivalent on a heat basis to methane factors, except the NO_X factor is 1.5x higher.

Flare at 24-1

Flare at 2	4-1													
Data	Total		Separ	ator Gas	Tar	k Gas	Pilo	ot Gas	GWP (11/	29/2013)	40 CFR	Part 98	Sub C GHG E	mission
Volume	12,701.740	scf/hr (Ind.)	300.0	Mscf/day	4.8	Mscf/day	0.0	Mscf/day	N ₂ 0=	298		Factor	s (Table C-1)	
H ₂ S mol%	0.0010%	mol%	0.0010%	mol%	0.0000%	mol%	0.0000%	mol%	CO ₂ =	1	$N_20 =$	(0.0001	kg/MMB
Heat Content	1427.25	Btu/scf (Ind)	1416.00	Btu/scf (Ind)	2124.62	Btu/scf (Ind)	2500.00	Btu/scf (Ind)	CH ₄ =	25	AF	42 Emi	issions Facto	ors ⁷
VOC MW	10.75	lb/lb-mol ²	10.49	lb/lb-mol ²	26.76	lb/lb-mol ²	43.24	lb/lb-mol ²			NO _X =		0.068	lb/MMBt
CO ₂	0.81%	mol%	0.82%	mol%	0.18%	mol%	0.00% mol%				CO=		0.37	lb/MMBt
CH₄	61.80%	mol%	62.31%	mol%	30.03%		0.00%	mol%			PM ₁ =		40	μg/L
C ₆	1.07	lb/lb-mol ²	1.06	lb/lb-mol ²	1.78	lb/lb-mol ²	0.00	lb/lb-mol ²						
OP Hours	8760	Hrs							(Ind. STP)	scf/lbmol=	380.67	60 °F	14.65	5 psia
Destruction Eff	98.00%	DRE	Hea	at Input	18.13	MMBtu/hr1			(EPA STP)	scf/lbmol=	385.5	68 °F	14.696	psia
				Po	tential F	lare Emissi	on Calcu	lations						
Pollutants														
PM,	40	μg	12701.7	scf (Ind.)	2.2E-9 lb	8,760	Hr	1 Ton	28.31685	L 1.01	scf(EPA)		0.141	Tons
FWI ₁	L			Hr	μg	Yea	ar	2,000 Lb	scf (EPA	1	scf(Ind.)	-	Yea	r
	1000	00 4	=											
SO ₂	168.3	Lb SO ₂ ⁴		MScf (Ind.)	0.001%	H ₂ S MoI%	8,760		1 Ton			= -		2 Tons
_	MScf (In	a.)		Hr			Year		2,000 Lb				Yea	r
	0.068	lb	18 120	MMBtu	8,760	Шr		Ton					5 300	Tons
NO _x	MMBtı		10.123	Hr		/ear	incharge continues.	00 Lb				_	Yea	
	IVIIVID((1							
со	0.37	lb	18.129	MMBtu	8,760	Hr	1	Ton	1				29.379	Tons
	MMBtu	ı		Hr		/ear	2,0	00 Lb			1		Yea	r
			I	1										
VOC⁵	,	12,701.7 Scf (Ind.) 1 lb-m				Lb VOC	8,760	400010101010101	1 Ton	2.00%	Inv. DRE			2 Tons
	Hr	1	380.67	scf (Ind.)	Lb	-Mole		/ear	2,000 Lb	_			Yea	r
	12,701.7	Scf (Ind.)	1	lb-mol	1.07	Lb C ₆	8,760	Hr	1 Ton	2.00%	Inv. DRE		3.140	Tons
HAPs ⁸	Hr	Joor (inta.)		scf (Ind.)	sortions. Norticals	-Mole	Year		2,000 Lb	2.0070		= -	Yea	
			000.07	00: (0.)		IVIOIO		cai	2,000 25					
CO ₂ 5,6	98.00% DRE	1.11E+08	Scf (Ind.)	1.61	lb-mol C	O ₂ (stoich.)	1	lb-mol gas	44.01	Ib CO ₂	1 Ton		10,132.14	Tons
of Combustion		Yr		1	lb-mol g	as (stoich.)	380.67	scf (Ind.)	lb-mol	e CO ₂	2,000 Lb		Yea	r
		0.44.13									1			
CO ₂	1.11E+08 Yr	Scf (Ind.)	0.81%	mol% CO ₂		lb-mol	Shelehelested	Lb CO2	1 Ton			= -		Tons
of Fuel	Yr		Sp.		380.67	scf (Ind.)	Lb-mole		2,000 Lb			L	Yea	r
	0.001 M Ton	0.001427	MMRtu	12,701.7	Scf (Ind.)	0.0001	ka	8,760	Hr	1.1023	Tons		0.017	Tons
N₂O	kg	Scf (In	retoctoots.	Hr		MME			ar		ric Ton	1 = -	Yea	
CH₄	1.11E+08	Scf (Ind.)	2.00%	Inv. DRE	61.80%	mol% CH ₄	1	lb-mol	16.043	Lb CH4	****		28.98	Tons
Uncombusted	Yr						380.675	scf (Ind.)	Lb-m	ole	2,000 Lb	_	Year	
							-							
	10,184.23	Tons	+		0.0175 Tons		+		28.98 Tons		<u> </u>		10,213.22	_
Mass Sum	Year	CO2				/ear			Year				Yea	r
		002				N2O				CH4		\longrightarrow		
	10,184.23	TPY	X 1		0.0175	TPY	X 298		28.98	TP :	X 25		10,913.91	Tone
CO₂e	10	184.23		+		5.22		+		724.46		= -	Yea	
2		CO2			N2O					CH4				T
¹ Date d Lleat C	apacity (MMBtu,	/Us) - Flavor	ata (Caf/	llw\ * lloot (`antant /		N 4N 4D+/1	0 ⁶ D+)						_
														-
	$nole$) = Σ (Mole?								IG Spreed :	Sheet for	gas anal	ysis		
	intained <500 lb						•							
	H_2S (Lb/hr) = Vo	lume (Scf/h	r) * (1 lb-	-mol/380.67	7) *(H ₂ S n	nol%) * (34.	.08 Lb H ₂ S	(Lb-mol)						
⁴ SO ₂ Conversi	on Factor 168.3	Lb SO ₂ /MSo	f of Gas											
- 2 - 2	223.0			f) */11h N/10	ام/300 <i>د</i> .	□ 7 Scf)* (64.0	1661450	- /I h-Mala\						+
5			JCI/IVIJC	1) (TED-1410	16/300.0	, July (04.0	700 ED 30	_{2/} LD-IVIOIE)						+
	e flare is 98% eff						-					$\sqcup \sqcup$		-
	sing the gas anal		by reliance of	han : : : :		aud :	tho:	han	 	d! ' !	0.04=1:			
	ere, Y _j = mole fra									ın aloxid	e, etc.) ar	ια κ _j = n	umper of ca	noarı
	ydrocarbon cons				bon diox	ide, 2 for e	thane, 3	or propane	e, etc.					
-	d to be "lightly s											\square		-
Hexane is a H	IAP. Assume He	kanes+ or H	exane are	HAPS										1

Flare at 13-11

14.65 14.696 0.204 Year	kg/MM ors ⁷ Ib/MME Ib/MME µg/L 5 psia 6 psia
001 ions Factor 168 37 0 14.65 14.696 0.204 Year 0.053 Year	kg/MM ors ⁷ Ib/MME Ib/MME µg/L 5 psia 6 psia 4 Tons
14.65 14.696 0.204 Year	lb/MME lb/MME lb/MME lb/MME lpg/L lb/mme lb/
14.65 14.696 0.204 Year 0.053	lb/MME lb/MME μg/L 5 psia 6 psia 4 Tons
14.65 14.696 0.204 Year 0.053	lb/MME µg/L 5 psia 6 psia 4 Tons Transatr
0 14.65 14.696 0.204 Year 0.053	μg/L 5 psia 6 psia 4 Tons
14.65 14.696 0.204 Year 0.053	5 psia 6 psia 4 Tons
0.204 Year 0.053	psia Tons
0.204 Year 0.053	psia Tons
0.204 Year 0.053 Year	4 Tons
Vear 0.053 Vear	ar
Vear 0.053 Vear	ar
Vear 0.053 Vear	ar
0.053 Year	
Year	3 Tons
Year	3 Tons
0.065	ır
	5 Tons
Year	
43.885	5 Tons
Year	ır
49.923 Year	
ieai	
5.910	0 Tons
Year	ır
15,182.98	3 Tons
Year	ır
64.05	E Tono
1001	-
0.0261	1 Tons
Year	ır
	4 Tons
Year	ır
15 280 10	0 Tone
Year	
	_
16,284.32	2 Tons
Year	ır
	T
	+
	+
	+
	-
iber of car	arbon
ber of car	arbon
ber of car	arbon
1	Yea 64.95 Yea 0.026 Yea 41.14 Yea 15,289.10 Yea

Flare at 13-15

Flare at 1														
Data	Total		Separ	ator Gas	Tan	k Gas		t Gas	GWP (11/		40 CFR		Sub C GHG Er	mission
Volume	13,780.828	scf/hr (Ind.)		Mscf/day	5.7	Mscf/day		Mscf/day	N ₂ 0=	298		Factor	s (Table C-1)	
H₂S mol%	0.0004%	mol%	0.0005%		0.0000%		0.0000%		CO ₂ =	1	$N_20=$		0.0001	kg/MMBt
Heat Content	1372.19	Btu/scf (Ind)		Btu/scf (Ind)				Btu/scf (Ind)	CH ₄ =	25	AF	42 Emi	issions Facto	rs′
VOC MW	9.28	lb/lb-mol ²	8.97	lb/lb-mol ²	26.76	lb/lb-mol ²	0.15	lb/lb-mol ²			NO _X =		0.068	lb/MMBti
CO ₂	0.76%	mol%	0.77%	mol%	0.18%	mol%	0.50%				CO=		0.37	lb/MMBtu
CH₄	63.99%	mol%	64.59%		30.03%		95.00%				PM ₁ =		40	μg/L
C ₆	0.85	lb/lb-mol ²	0.83	lb/lb-mol ²	1.78	lb/lb-mol ²	0.01	lb/lb-mol ²						
OP Hours	8760	Hrs							(Ind. STP)	scf/lbmol=	380.67	60 °F	14.65	psia
Destruction Eff	98.00%	DRE	Hea	at Input	18.91	MMBtu/hr1			(EPASTP)	scf/lbmol=	385.5	68 °F	14.696	psia
				Po	tential F	lare Emissi	ion Calcu	lations						
Pollutants			ı											
PM,	40	μд		scf (Ind.)	2.2E-9 lb	8,760		1 Ton	28.31685	_	scf(EPA)		0.153	_
'	L			Hr	μg	Yea	ar	2,000 Lb	scf (EPA) 1	scf(Ind.)		Year	•
	168.3	Lb SO ₂ ⁴	13.781	MScf (Ind.)	0.000%	H ₂ S Mol%	8,760	Úг	1 Ton				0.045	-
SO ₂	MScf (In		13.761	Hr	0.000%	H2O IVIOI /0	- 4	ear	2,000 Lb			= -	0.045 Year	
	IVISCI (III	u.)		111			-4	Cai	2,000 Lb				Icai	
	0.068	lb	18.910	MMBtu	8,760	Hr		Ton					5.632	Tons
NO _x	MMBti			Hr		'ear		00 Lb				_	Year	
со	0.37	lb	18.910	MMBtu	8,760	Hr		Ton					30.645	Tons
00	MMBt	u		Hr	١	'ear	2,0	00 Lb		A D	1		Year	:
			l .	l										_
VOC⁵	13,780.8	Scf (Ind.)		lb-mol		Lb VOC	8,760	400000000000	1 Ton	2.00%	Inv. DRE		29.424 Year	
	Hr		380.67	scf (Ind.)	Lb	-Mole	Y	'ear	2,000 Lb				rear	
	13,780.8	Scf (Ind.)	1	lb-mol	0.85	Lb C ₆	8,760	Hr	1 Ton	2.00%	Inv. DRE		2.689	Tons
HAPs ⁸	Hr	100. ()	380.67	scf (Ind.)	COSTOSIO, VOCASSIONIO	-Mole		'ear	2,000 Lb			=	Year	
				. ,										
CO ₂ 5,6	98.00% DRE	1.21E+08	. ,	1.53	Todanadani dan	O ₂ (stoich.)	A legeopoopoops,	lb-mol gas	44.01	lb CO ₂	1 Ton	_	10,491.28	Tons
of Combustion		Yr		1	lb-mol g	as (stoich.)	380.67	scf (Ind.)	lb-mol	e CO ₂	2,000 Lb		Year	:
00	1.21E+08	Scf (Ind.)	1 0 76%	m alg/ CO	1	lb-mol	14401	Lb CO2	1 Ton				52.81	Tono
CO ₂ of Fuel	1.21E+06 Yr	SCI (IIIU.)	0.70%	mol% CO ₂		scf (Ind.)	Lb-mole	LU COZ	2,000 Lb			= -	Year	
of ruei	.,		P		300.07	301 (IIIu.)	LED INIOIC		2,000 Lb				Icai	
N.O.	0.001 M Ton	0.001372	MMBtu	13,780.8	Scf (Ind.)	0.0001	kg	8,760	Hr	1.1023	Tons		0.0183	Tons
N ₂ O	kg Scf (I		nd.) Hr			MME	Btu	Ye	ear 1 Metr		ric Ton	1 = 1	Year	ŕ
											,			
CH₄	1.21E+08	Scf (Ind.)	2.00%	Inv. DRE	63.99%	mol% CH ₄	VOE020202	lb-mol		Lb CH4	1 Ton		32.56	
Uncombusted	Yr				4		380.675	scf (Ind.)	Lb-m	ole	2,000 Lb		Year	,
	10,544.09	Tono			0.0183	Tono	P		22	EG Tono			10,576.66	Tono
Mass Sum	10,544.09 Year		+		Acceptance to the second	ear	+		32.56 Tons		<u>s</u> =		Year	_
mass cam	tear	CO2			M.	N2O				Year CH4				T
		1				INZO				ОП4				
	10,544.09	TPY	X 1		0.0183	TPY	X 298		32.56	TP :	X 25		11,363.42	Tons
CO₂e	10	,544.09		+		5.44		+		813.89	=		Year	
		CO2				N2O				CH4				
¹ Rated Heat C	apacity (MMBtu	/Hr) = Flowr	ate (Scf/	Hr) * Heat (ontent (Rtu/Scf) * (MMRtu/1	∩ ⁶ Btu)						
	nole) = Σ (Mole)								IC Sprood 9	Shoot for	ranc anali	vcic		
									io spreed :	sneet roi	gas anai	ysis		-
Has to be ma	intained <500 lb													-
	H_2S (Lb/hr) = Vo	lume (Scf/h	r) * (1 lb-	-mol/380.6	7) *(H₂S n	nol%) * (34	.08 Lb H ₂ S	/Lb-mol)						
⁴ SO₂ Conversi	on Factor 168.3	Lb SO ₂ /MSo	f of Gas											
		=(1.000	Scf/MSc	f) *(1Lb-Mc	le/380.6	7 Scf)* (64.0	066 Lb SO	/Lb-Mole)			-			
5 Accumina +1-	a flara is 000/ -ff		. ,	, ,,	.,	., (
	e flare is 98% eff sing the gas anal													-
	sing the gas anal ere, Y _i = mole fra		hydrocar	hon constit	l luents' i /	such as mo	thane et	hane pron	lane carbo	n diovid	e etclar	nd R n	umher of ca	rhon
	•									ii uioxiu	c, eic.j di	iu isj– II	umber of cd	IDON
	ydrocarbon cons				nou glox	iue, ∠ tor e	mane, 31	or propane	e, etc.		1			Т
-	d to be "lightly:													-
Hexane is a F	IAP. Assume He	xanes+ or H	exane are	HAPS										

Flare 18-13

Flare 18-1	3													
Data	Total		Separator Gas Tank Gas			Pilo	ot Gas	GWP (11/2	29/2013)	40 CFR	Part 98	Sub C GHG Er	mission	
Volume	12,660.867	scf/hr (Ind.)	300.0	Mscf/day	3.9	Mscf/day	0.0	Mscf/day	N ₂ 0=	298		Factor	s (Table C-1)	
H ₂ S mol%	0.0006%	mol%	0.0006%	mol%	0.0000%	mol%	0.0000%	mol%	CO ₂ =	1	$N_20 =$	(0.0001	kg/MMBt
Heat Content	1421.38	Btu/scf (Ind)	1412.33	Btu/scf (Ind)	2124.62	Btu/scf (Ind)	1020.00	Btu/scf (Ind)	CH ₄ =	25	AF	42 Emi	issions Factor	rs ⁷
VOC MW	10.55	lb/lb-mol ²	10.34	lb/lb-mol ²	26.76	lb/lb-mol ²	0.15	lb/lb-mol ²			NO _X =		0.068	lb/MMBtu
CO ₂	0.76%	mol%	0.76%	mol%	0.18%	mol%	0.50%	mol%			CO=		0.37	lb/MMBtu
CH ₄	62.23%	mol%	62.65%	mol%	30.03%	mol%	95.00%				PM ₁ =		40	μg/L
C ₆	1.10	lb/lb-mol ²	1.09	lb/lb-mol ²	1.78	lb/lb-mol ²	0.01	lb/lb-mol ²						
OP Hours	8760	Hrs							(Ind. STP)	scf/lbmol=	380.67	60 °F	14.65	psia
Destruction Eff	98.00%	DRE	Hea	at Input	18.00	MMBtu/hr1			(EPASTP)	scf/lbmol=	385.5	68 °F	14.696	psia
				Po	tential F	lare Emissi	on Calcu	lations						
Pollutants														
PM,	40	μg		scf (Ind.)	2.2E-9 lb	8,760		1 Ton	28.31685	L 1.01	scf(EPA)	l _ l	0.140	Tons
1 IM ₁	L			Hr	μg	Yea	ar	2,000 Lb	scf (EPA) 1	scf(Ind.)	_ [Year	
	100.0	00 4												
SO ₂	168.3	Lb SO ₂ ⁴	12.661	MScf (Ind.)	0.001%	H ₂ S Mol%	8,760		1 Ton			= -	0.057 Year	
	MScf (In	a.)		Hr			L	'ear	2,000 Lb				Year	
	0.068	lb	17 996	MMBtu	8,760	Hr		Ton					5.360	Tons
NO _x	MMBt		17.550	Hr		rear		00 Lb				_	Year	
		_				J. A.						_		
co	0.37	lb	17.996	MMBtu	8,760	Hr	1	Ton					29.164	Tons
CO	MMBt	u		Hr	١	/ear	2,0	00 Lb			h		Year	
				l										
VOC5	12,660.9	Scf (Ind.)		lb-mol		Lb VOC	8,760	400000000000	1 Ton	2.00%	Inv. DRE		30.742	
	Hr		380.67	scf (Ind.)	Lb	-Mole	Y	ear	2,000 Lb				Year	
	12,660.9	Scf (Ind.)	1	lb-mol	1.10	Lb C ₆	8.760	Hr	1 Ton	2.00%	Inv. DRE		3.215	Tons
HAPs ⁸	Hr	00: (0.)		scf (Ind.)	Toology, 40010010	-Mole	-,	'ear	2,000 Lb	2.0070			Year	
						141010		oui,	, -,					
CO ₂ 5,6	98.00% DRE	1.11E+08	Scf (Ind.)	1.60	lb-mol C	O ₂ (stoich.)	1	lb-mol gas	44.01	lb CO ₂	1 Ton		10,042.79	Tons
of Combustion		Yr		1	lb-mol g	as (stoich.)	380.67	scf (Ind.)	lb-mole	e CO ₂	2,000 Lb		Year	
00	1.115.00	Cof (lad)	0.769/		1	lb mal	14401	16.000	1 Tan		1		40.50	Tono
CO ₂	1.11E+08 Yr	Scf (Ind.)	0.76%	mol% CO ₂		scf (Ind.)	Lb-mole	Lb CO2	1 Ton 2,000 Lb			= -	48.50 Year	
of Fuel	.,		P		300.07	301 (IIIu.)	LO MOIC		2,000 Lb				1001	
	0.001 M Ton	0.001421	MMBtu	12.660.9	Scf (Ind.)	0.0001	ka	8,760	Hr	1.1023	Tons		0.0174	Tons
N ₂ O	kg Scf (nd.) H			MME		Ye			ric Ton	1 = 1	Year	
CH ₄	1.11E+08	Scf (Ind.)	2.00%	Inv. DRE	62.23%	mol% CH ₄	*CECECEO	lb-mol		Lb CH4	1 Ton		29.09	
Uncombusted	Yr				1		380.675	scf (Ind.)	Lb-m	ole	2,000 Lb		Year	•
	(2,22,22	_				_	-							1_
Mass Sum	10,091.29		+		0.0174 Tons		+		29.09 Tons		<u>S</u> =		10,120.40 Year	-
wass sum	Year	CO2			 	/ear				Year			Icai	T
		J				N2O				CH4				
	10,091.29	TPY	X 1		0.0174	TPY	X 298		29.09	TP :	X 25		10,823.66	Tons
CO ₂ e	10	,091.29		+		5.18	+			727.19	=		Year	
		CO2				N2O				CH4				
1 Rated Heat C	apacity (MMBtu	/Hr) = Flower	ate (Scf/	Hr) * Hoot (Ontent /		N/N/R+11/1	∩ ⁶ Rtu\						
	$nole$) = Σ (Mole)								IC Coroad C	Shoot for	r gas anali	vcic		
									iG Spreed S	sneet for	gas anai	ysis		-
Has to be ma	intained <500 lb													-
	H_2S (Lb/hr) = Vo	lume (Scf/h	r) * (1 lb-	-mol/380.6	7) *(H₂S n	nol%) * (34	.08 Lb H ₂ S	/Lb-mol)						
⁴ SO ₂ Conversi	on Factor 168.3	Lb SO ₂ /MSo	f of Gas											
		=(1.000	Scf/MSc	f) *(1Lb-Mc	ole/380.6	7 Scf)* (64.0		/Lb-Mole)						
5 A cov	o flamo := 000/ - 51		33., 14130	., (220 1710	, 500.0	. 50., (04.)		.,						
	e flare is 98% eff													
	sing the gas anal ere, Y _i = mole fra		hydrocar	hon constit	tuants' i /	such as ma	thang of	hang pron	ane carbo	n diovid	e etc l a	nd R = n	umber of co	rhon
										ii uioxiu	e, ett.) di	iu nj- II	uniber Of Cdl	IDUII
	ydrocarbon cons				roon diox	ιαe, 2 tor e	tnane, 3 f	or propane	e, etc.					
-	ed to be "lightly:										-			
Hexane is a H	IAP. Assume He	xanes+ or H	exane are	e HAPS										

Flare at 14-9

Flare at 1	4-9													
Data	Total		Separ	ator Gas	Tan	k Gas	Pile	ot Gas	GWP (11/	29/2013)	40 CFR	Part 98	Sub C GHG E	mission
Volume	12,660.867	scf/hr (Ind.)	300.0	Mscf/day	3.9	Mscf/day	0.0	Mscf/day	N ₂ 0=	298		Factors (Table C-1)		
H₂S mol%	0.0006%	mol%	0.0006%	mol%	0.0000%	mol%	0.0000%	mol%	CO ₂ =	1	$N_20 =$	(0.0001	kg/MMB
Heat Content	1421.38	Btu/scf (Ind)	1412.33	Btu/scf (Ind)	2124.62	Btu/scf (Ind)	1020.00	Btu/scf (Ind)	CH ₄ =	25	AF	P 42 Emissions Fa		ors ⁷
VOC MW	10.55	lb/lb-mol ²	10.34	lb/lb-mol ²	26.76	lb/lb-mol ²	0.15	lb/lb-mol ²			NO _X =		0.068	lb/MMBt
CO ₂	0.76%	mol%	0.76%	mol%	0.18%	mol%	0.50% mol%				CO=		0.37	lb/MMBt
CH ₄	62.23%	mol%	62.65%	mol%	30.03%		95.00%	mol%			PM ₁ =		40	μg/L
C ₆	1.10	lb/lb-mol ²	1.09	lb/lb-mol ²	1.78	lb/lb-mol ²	0.01	lb/lb-mol ²						
OP Hours	8760	Hrs							(Ind. STP)	scf/lbmol=	380.67	60 °F	14.65	5 psia
Destruction Eff	98.00%	DRE	Hea	at Input	18.00	MMBtu/hr1			(EPASTP)	scf/lbmol=	385.5	68 °F	14.696	o psia
				Po	tential F	lare Emissi	on Calcu	lations						
Pollutants														
PM,	40	μg	12660.9	scf (Ind.)	2.2E-9 lb	8,760	Hr	1 Ton	28.31685	L 1.01	scf(EPA)	_	0.140	0 Tons
FIW1	L			Hr	μg	Yea	ar	2,000 Lb	scf (EPA	1	scf(Ind.)	-	Yea	r
	1000	00 4		1.00 (41 1)	I				1 -					
SO ₂	168.3	Lb SO ₂ ⁴	12.661	. ,	0.001%	H ₂ S MoI%	8,760		1 Ton			= -		7 Tons
	MScf (In	a.)		Hr			Year		2,000 Lb				Yea	r
	0.068	lb	17 006	MMBtu	8,760	Шr		Ton					5 360	0 Tons
NO _x	MMBtı		17.550	Hr		rear	1002000200020020	00 Lb				_	Yea	
	IVIIVID((<u>'</u>		,,							
со	0.37	lb	17.996	MMBtu	8,760	Hr	1	Ton					29.164	4 Tons
CO	MMBtu	ı		Hr	١	/ear	2,0	00 Lb				-	Yea	r
VOC⁵	12,660.9	Scf (Ind.)		lb-mol		Lb VOC	8,760	A00010101010101	1 Ton	2.00%	Inv. DRE	- = 1		2 Tons
	Hr	1	380.67	scf (Ind.)	Lb	-Mole		/ear	2,000 Lb	_			Yea	r
	12,660.9	Scf (Ind.)	1	lb-mol	1.10	Lb C ₆	8,760	Hr	1 Ton	2.00%	Inv. DRE		3.21!	5 Tons
HAPs ⁸	12,000.5 Hr	Oci (ilia.)		scf (Ind.)	1004101A, NEOTHORNO	-Mole	Year		2,000 Lb	2.00 /6		= -	Yea	
			000.07	00: (0.)	1	IVIOIO	<u> </u>	cai	2,000 20					
CO ₂ 5,6	98.00% DRE	1.11E+08	Scf (Ind.)	1.60	lb-mol C	O ₂ (stoich.)	1	lb-mol gas	44.01	Ib CO ₂	1 Ton		10,042.79	Tons
of Combustion		Yr		1	lb-mol g	as (stoich.)	380.67	scf (Ind.)	lb-mol	e CO ₂	2,000 Lb		Yea	r
		0.44.13	1								1			
CO ₂	1.11E+08 Yr	Scf (Ind.)	0.76%	mol% CO ₂		lb-mol	Heteletetet	Lb CO2	1 Ton			= -		Tons
of Fuel	11		P		360.67	scf (Ind.)	Lb-mole		2,000 Lb				Yea	.r
	0.001 M Ton	0.001421	MMRtu	12 660 9	Scf (Ind.)	0.0001	ka	8,760	Hr	1.1023	Tons		0.017	4 Tons
N ₂ O	kg Scf (I		proposos. Opososos			MME			ar		ric Ton	1 = 1	Yea	
CH ₄	1.11E+08	Scf (Ind.)	2.00%	Inv. DRE	62.23%	mol% CH ₄	V03503503507	lb-mol		Lb CH4 1 Ton				9 Tons
Uncombusted	Yr				14		380.675	scf (Ind.)	Lb-m	role	2,000 Lb		Yea	r
	10,001,00	-			0.0171	-	-			00 T			40 400 4	
Mass Sum	10,091.29	Ions	+		0.0174 Tons Year		+		29.09 Tons		<u>s</u> =		10,120.40 Yea	_
Mass Sulli	Year	CO2											Ica	<u>.</u>
		002				N2O				CH4				
	10,091.29	TPY	X 1		0.0174	TPY	X 298		29.09	TP :	X 25		10,823.66	Tons
CO₂e	10	,091.29		+		5.18		+		727.19	=		Yea	
_		CO2				N2O				CH4				
1 Rated Heat C	apacity (MMBtu,	/Hr) - Flowr	ata (Scf/	Hr) * Hoat (Content (Rtu/Scf\ * /	NANAR+ii/1	0 ⁶ Β+μ)						
									IC C	^l + £				+
	$mole$) = Σ (Mole								iG Spreed :	Sneet for	gas anai	ysis		-
³ Has to be ma	intained <500 lb					•	•							-
	H_2S (Lb/hr) = Vo	lume (Scf/h	r) * (1 lb-	-mol/380.6	7) *(H₂S n	nol%) * (34.	.08 Lb H ₂ S	(Lb-mol)						
⁴ SO₂ Conversi	on Factor 168.3	Lb SO ₂ /MSo	f of Gas											
		=(1.000	Scf/MSc	f) *(1Lb-Mc	le/380.6	7 Scf)* 164 (066 Lb SΩ	/Lb-Mole\		-				
5 A course ! ! !	flore is 000/ · ff		33., 14130	., (225 1710	, 555.0	. 50., (04.0	20 20 30	ر اعتار المار الما						+
	e flare is 98% eff						-				-			+
	sing the gas anal ere, Y _i = mole fra		hydrocar	hon constit	l luents' i /	such as mo	thane of	hane pror	lane carbo	n diovid	e etclar	nd R n	umber of c	arhon
	•									iii uioxid	e, ett.) di	iu n _j = N	unibel Ol Co	ווטטוג
	ydrocarbon cons				nou glox	iue, 2 for e	mane, 31	or propane	e, etc.		I			
-	d to be "lightly s										-			-
Hexane is a l	IAP. Assume He	kanes+ or H	exane are	HAPS										